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RAILWAY
AND
OTHER ACCIDENTS

WITH RELATION TO

Injury and Disease of the Nervous System

A Book for Court Use.

BY

ALLAN McLANE HAMILTON, M.D., F.R.S.E.

Late Clinical Professor of Mental Disease in Cornell Medical College; one of the Consulting Physicians of the Manhattan State Hospitals; formerly Physician-in-Chief of the New York State Hospital for Diseases of the Nervous System, and attending Physician to the Hospital for Epileptic and Paralyzed, New York City; President of the Psychiatric Society of New York; member of the American Neurological Association; member of the Medical Society of London, and co-editor of "A System of Legal Medicine."

With Fifteen Plates, Two Superimposed Charts and Thirty-six Illustrations

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PREFACE.

THIS work is intended for Doctors of Medicine as well as for Lawyers, and especially for use in court. The author, whose experience in connection with accident cases has during the past thirty years been somewhat extensive, believes that a book of this kind and scope will be acceptable to those who have hitherto been obliged to rely upon treatises which have taken one extreme view or the other as to the side of the plaintiff or defendant. The author aims to be always just, and, while attacking fraud on the one hand and on the other giving due prominence to the incapacitating effects of real injury, seeks to show in hysterical and unconsciously exaggerated cases where the neurotic predisposition exists, just how much the accident has to do with the alleged suffering and future condition of the litigant. In this attempt the patient's proper claims are protected while at the same time an effort is made to prevent the railway from being mulcted, or, at least, to show that it is not entirely accountable. The time has certainly come for some one who is initiated, and has sufficient knowledge, to urge the proper and honest presentation of medical facts in court by the plaintiff as well as the defendant, for it does not do to pervert medical truths which in their way are quite as well settled as the axioms of the law. It is the author's aim to present his material as simply as possible, and to avoid involved statements and discussion. Believing that the

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method of Caspar (which consists in the presentation of illustrative cases) is the most serviceable and helpful in a book of this kind, a large number of these—in most of which the author has appeared—are presented in the following pages. A glossary has also been provided for non-medical readers.

This work is not so much for the specialist as for those who go into court needing practical help.

In conclusion I wish to acknowledge my indebtedness to Drs. William Hirsch, R. Bell, C. C. Petit, and G. De F. Smith, to D. W. Patterson, Esq., and John Benning, Esq., both of the Metropolitan Street Railway Company, for valuable aid.

ALLAN MCLANE HAMILTON.

44 EAST 29TH STREET, NEW YORK.

May 1st, 1904.

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RAILWAY AND OTHER ACCIDENTS.

INTRODUCTION.

THE spirit of acquisitive litigation has undoubtedly existed since the establishment of legal tribunals, and the disposition of the majority of mankind, when suffering through the laches of others, has generally been to ignore the simpler forms of settlement and arbitration and "go to law" to obtain compensation for real or fancied wrongs.

Sometimes the machinery of justice enables the aggrieved one, as he thinks, not only to obtain balm for his wounds of mind or body, but to punish the other more publicly and fully, thus at once filling his pocket and revenging himself. The belief may also exist that in the hearts of the twelve jurymen ample sympathy may be aroused by a tale of woe, which would not be the case with a hard-hearted adjuster of claims whose days are spent in investigating and settling such cases as his, and who of necessity cultivates a highly critical and discriminating sense of the fitness of things. Probably the simple recital of the plaintiff's story also brings with it the satisfaction which so often attends the expression of suffering, for it need hardly be said that the human tendency is to derive comfort from the privilege of sharing its troubles with others. Then, again, the love of a fight is a human weakness that sometimes leads the individual to lose sight of the fact that his best interests may be more advantageous-

ly settled by a calm argument in camera, for it is doubtful if the real help of a tribunal is appreciated at all by a certain class of claimants. Then, again, it would seem as if an imitative tendency had frequently led to the bringing of suits, for certain cities (notably Brooklyn and New York) have more litigants of this kind than others, and at times there is almost an epidemic of damage suits.

Another incentive not to be despised as an important factor is the influence of a book upon so-called "Spinal Concussion," written some years ago by a distinguished English surgeon, Mr. John Eric Erichsen, which among other things sought to show that often the most trivial shock might be followed by the gravest symptoms of progressive nervous disease; that railway shocks were the worst of all in fact, and litigants and their friends were apprised of clinical and pathological possibilities that were before this undreamed of except by a small number of French physicians who were prepared to ascribe to "ébranlement" an etiological importance, which in reality was often the product of guesswork and speculation; so that Erichsen's little volume became a guide book that might lead the dishonest plaintiff, if he felt so disposed, to set out upon the broad road of imposture and dissimulation with the expectation of getting a heavy verdict. There have been but few cases during the past twenty-five years in which the writer has appeared upon the witness stand that this work has not been introduced by the plaintiff's counsel and made to do yeoman's duty.

Long before Erichsen's advent and subsequently, Tardieu, whose medico-legal experience was perhaps greater than that of any other teacher, had seen and reported no less than sixty accident cases of varying severity, and he

had no difficulty in discriminating between those of a serious character and the vague cases which he considered hysterical, or examples of malingering and exaggeration.

Although at all times there has undoubtedly been too much recourse to courts of law and too little to arbitration, one must to-day stand aghast at the wholesale litigation indulged in since railways of all kinds have increased and new methods of propulsion, not entirely free from danger, have been adopted; for a certain number of accidents must occur in spite of the improved safeguards and the most active precautions.

The bulletin of the Interstate Commerce Commission shows that for the three months alone ending March 31st, 1903, 300 persons were killed and 2,854 injured in train accidents in the United States, including those injuries sustained by employees at work and by passengers getting on or off cars, and by minor accidents which increased the figures to 827 killed and 11,481 injured. There were 2,831 collisions and derailments of all trains, and 291 collisions and 125 derailments affecting passenger cars. This is a decided increase over previous statistics, and it would be of interest to know the sums already paid in settlement or to be paid as the result of such litigation. From a comparison of steam and electric road casualties in the United States it will appear that the trolley lines have six times as many deaths and nearly ten times as many injuries as the steam roads, as will be shown by the following table:

	Electric Roads.	Steam Roads.
Miles of track	25,859	265,352
Passengers carried	4,813,466,000	607,278,121
Passengers killed	1,216	282
Passengers injured	47,428	4,988

It would be a difficult matter to estimate the amount of damages paid annually throughout the world by railroads to claimants who present themselves with real or assumed injuries. Sums of thirty to forty thousand dollars have been many times awarded by sympathetic juries, and one serious accident will often wreck a corporation. The trolley or street lines fare worse than the steam roads, for the reason that on the former it is impossible to safeguard passengers who often persist in getting off the car before it stops or in the wrong way, and because, to a certain degree, it is obliged to pick up or set down passengers at places most convenient for the latter. A steam road, on the contrary, stops only at fixed stations, its cars are enclosed, its lines are fenced off, and it has the right of way.

The situation is getting constantly worse for the street lines, and the Brooklyn Rapid Transit Company will serve as an illustration of this, for in 1902 its earnings amounted to $12,500,000, and its expenditure for the settlement of damage claims was over $1,000,000, or nearly ten per cent of the gross receipts.

The average damage loss throughout the United States is nearly five per cent, and the example of the easy way in which money is made by a large number of the claimants undoubtedly induces others to embark in the same profitable business, and, for a time at least, the losses will increase.

As a rule the real sufferers are more poorly paid than the exaggerators or impostors, and many people who are deserving of compensation go without any rather than undergo the annoyance of appearing in court and being badgered by cross-examination, or by the loss of time and

neglect of more important affairs. The victims who are well-to-do are naturally not so much inclined to demand compensation as others who have everything to gain, but it is to be hoped that eventually all of these cases will be submitted to expert examiners whose report shall form the basis of arbitration; for too often other belongings of the case than the injury itself and the patient's condition are considered, and the spectacle of a comely young woman on the witness stand, or an apparently helpless patient wheeled into the court-room or brought in on a litter, will lead to the awarding of an undeserved verdict. Dorliat says: "It is to be regretted that in certain cases there may be too great a disproportion between the indemnity received and the gravity of the accidents, whether the indemnity be insufficient, or, on the contrary, the damages be excessive. . . . This arises from the difficulty of making a prognosis sometimes, and it would be well if the case could be reopened and the patient's subsequent condition determined."

The cases of this writer, as well as most of those known to medical men who are at all familiar with the subject of railroad litigation for personal injury, show that wide latitude exists both in connection with the allowance of damages and in the withholding of compensation. The error in judgment is more often connected with the first, and it is comparatively rare for a case to grow worse after the receipt of a substantial verdict. The German system (*Unfallheilkunde*), which is so general, not only fixes in an intelligent and equitable way the amount of indemnity in a given accident case, but insures subsequent additional compensation if the patient's state becomes aggravated or complicated, or there is a reduc-

tion of the contingent award if he improves. As has been said, the jury system is not all it should be, for it is difficult to convey to a body of laymen—no matter how conscientious and fair-minded—a true idea of the reality of the patient's claim; or, again, to point out to them what is perhaps exaggeration, either intentional or the reverse, or the barest simulation. So indulgent have juries become that the policy of most roads is to settle if they can out of court for any reasonable sum; but the demands are growing more and more excessive, and the court calendars are correspondingly laden with impending cases. In the city of New York alone, the suits in which claims for personal injuries figure are so numerous that the work of the local division of the Court of Appeals has two-thirds of its time taken up with contested cases of this nature, and the lower courts are even more busy.

The great car lines are represented by a small army of lawyers and claim adjusters who seek in vain to relieve the congestion of cases, but in spite of this the number of hungry claimants for real or undeserved compensation has so greatly increased during the last two decades that it not only keeps the courts busy with legitimate cases, but has developed a form of legal practice in which the temptation among disreputable persons is to manufacture evidence or form conspiracies for the purpose of fleecing corporations; and although radical criminal prosecutions have been often instituted, this species of villany still flourishes. Throughout the entire country we find the same state of things, for there seems to have been engendered a litigious spirit and a search for gain which has induced individuals to embark upon well-organized plots, going from one city to another, concocting testimony and

inducing numerous persons to perjure themselves, and where the railroad has had no report of an accident (and probably none has occurred), these dishonest individuals have had the hardihood to go into court and by the boldest false testimony get a verdict. Such a case was that brought by a young woman seen by the writer several years ago, who with the help of her father and others deceived the New York Elevated Railroad and a distinguished surgeon so successfully that she received compensation to the extent of $3,000 for a deformity of the sternum which she claimed had been produced by an injury, but which, in reality, had been of long standing, and was caused by the too early use of a machine for making moulds for artificial leaves. It subsequently transpired that she had never been in the defendant's car at all at the time of the accident. This is one of numerous cases, to some of which allusion will subsequently be made, and which illustrate what has just been said.[1]

The history of litigation connected with personal injury certainly shows that, until a comparatively recent time, damage suits were always brought for material injuries—the loss of an arm, leg, or an eye—as the result of violence, and there were usually objective appearances which were unmistakable. Little or no attention was paid to the mere relation of subjective suffering, except perhaps in the matter of alleged impotence, when much latitude was permitted, the affliction being regarded as being dependent upon some physical weakness and not due, as it is often to-day, to psychical inhibition. While frauds were largely practised, the methods of the dishon-

[1] See Freeman cases, reported by Bailey.

est plaintiff did not compare with the iniquities of the present time.

The exhibition of violence which takes place in a railroad accident is necessarily of the most varying kind, and its results range from simple abrasions, jars and wrenches, to fractures and dislocations, muscular and tendinous rupture, nerve injuries, wounds of many kinds, and often more or less injury of deeper parts. When, for instance, we consider a telescopic collision with all its horrors of broken woodwork and glass, splinters and twisted ironwork, we may appreciate the possible consequences to the unfortunate passenger. Strange to say, the material accidents lead to fewer suits than certain ill-defined injuries which leave no external trace. The burden of the complaint of most of the plaintiffs, which is generally reinforced by more or less expert testimony, is that they are the victims of *shock*. Now there is no subject about which so much ignorance exists as the effect of shock upon the human subject, and none which has been so differently interpreted by medical men upon the witness stand. Of course the misleading hypothetical question has had much to do with this, but medical literature, especially during the past few years, has sadly confused the cases presenting more or less conspicuous symptoms of an objective kind, in which well-marked central lesions existed, with those of a peculiar psychical type. So, too, sight has been lost of the mental organization of the patient, his susceptibility to suggestion, and the influence exerted by anxious or grasping relatives with whom he may be housed; or occasionally the methods of an ingenious or unprincipled lawyer. It may be confidently stated that many persons are injured or sub-

jected to great shock who do not present any after-effects whatever, but with the prospect of litigation ahead and possible awards in view, usually under suggestion, develop a train of familiar symptoms which are better known to the habitués of the courts than to the profession. Page says: "It will not be denied, we think, that there is a very widespread impression that the spine and spinal cord are liable before all other parts to meet with injury in railway collisions; and under the name 'concussion of the spine' is classed a number of complaints and symptoms which are commonly met with after railway accidents, but are rarely seen or heard of in the ordinary practice of the profession."

While, as has been said, these patients come into court with symptoms which are too often suggested, it does not follow by any means that they are always malingerers or knowingly impostors; but that their condition is what the writer many years ago termed the "litigation psychosis." A state exists which is modified by the excitement before and incident to the trial, by the expectation of a favorable verdict, or by the various forms of disappointment that may be felt, as is well known. All this often disappears with a settlement of the claim and when the suspense is over, although in exceptional instances the mental mischief that has been done is such as to give rise to a serious if not permanent continuance of ill health. "Shock" is really a most general and elastic term, and applies to so many varying kinds of sudden depression of the vital powers, and so many different causes, that it should not be necessarily accepted unreservedly until after it has been analyzed and clearly defined in the case under consideration. Generally speak-

ing, it is a state due to a sudden exhausting or depressing influence for which the individual is usually unprepared, and, as has been said, there has been made a more or less profound impression upon the vital forces, the extent of which depends upon the subject's power of resistance.

In this connection attention may be directed to what might be called the *preparedness*, that is to say, the attitude of the individual so far as expectation is concerned. It is a somewhat curious fact that many persons engaged in occupations, or exposed in ways fraught with more or less likelihood of danger, rarely suffer from nervous conditions, which, on the contrary, are expressed by those who are unconscious of any impending injury and who succumb at once upon its receipt.

Prince several years ago took the trouble to collect statistics which show that there is a comparative absence of nervous disorder among those who are on the lookout, or who are consciously "taking their chances." He found that while football players may sustain almost any form of violent injury, they are never the subjects of traumatic neurasthenia or hysteria. Outten also found that of 18,275 cases of railway injury among employees, there were but 8 cases of the so-called traumatic neurosis, or 1 in a little over 2,000; while of 884 injured passengers, there were 11, or 1 in about 76.

The physical results of severe shock are those dependent upon the impaired cardiac force with resultant cerebral anemia, and for a time an exhaustion of general nervous function. The mental symptoms are ordinarily at first unconsciousness, and afterward depression and psychasthenia. These latter may exist for a long time, possibly leading to forms of neurasthenia and to a psy-

chosis of a characteristic kind, should conditions be favorable for its development. It is hardly necessary in this connection to call attention to the careless way in which the word "shock" is used in courts of law, or to say that, strictly speaking, shock may be applied to an ordinary fall without consequences; or, on the other hand, to the results of a blow that may instantly kill the person. So the medical witness should be careful in accepting unreservedly the general meaning that the examiner seeks to attach to the word in any particular case.

While there can be little dispute about the existence of the *real* evidences of external injury and their possible mode of receipt, battles royal have been fought in settling the question with regard to the extent and exhibition of that kind of shock which leaves no external mark.

The signs of general ill health which follow long brooding and enforced invalidism, the loss of fresh air, and the discontinuance of a regular occupation need not be ascribed to shock; and why should fright incident to a railway accident differ so radically from that of a dozen other kinds which rarely leave any such traces; or the train of ill-assorted symptoms preserve such an invariable similarity, especially when presented by an ignorant person, unless they be thought of by some one else and proposed by him? A series of well-directed questions, based upon the familiar lines of Erichsen and his followers, may be all that is needed to prepare a very plausible basis for a suit such as is so often brought, and in which the symptom complex is clearly inconsistent with the expressions of genuine disease.

The personal equation is of course an element of great importance, and much depends upon the relations of tem-

perament and previous habits and mode of life to the development of the vague nervous states under discussion. As a rule the active, intellectual man is more readily apt to collapse under mental excitement and become demoralized than the individual of coarser stuff. This insensitiveness which belongs to the unintelligent and criminal is, I think, generally recognized. Lombroso and other criminologists and psychiatrists know that in persons of low organization a variety of ordinarily painful injuries and mutilations may be borne without suffering. This same inhibition of painful sensory impressions, which is also seen among religious enthusiasts, stoics, and savages, undoubtedly plays a part in enabling the malingerer to carry out his rôle; this, however, must not be confounded with the analgesia of true hysteria. The hypersensitiveness of the first named leads to the greater susceptibility from within or without and to consequent loss of self-control.

The writer has known many subjects of this kind to give up entirely and surrender to their aroused and dominating emotions after the most trifling shock or injury, who in their capacity for resistance have shown much courage under other circumstances.

A lucrative occupation has sometimes been abandoned, and the available time of the person has been given to visiting physicians, or talking to any willing listener. The dull, unimaginative laborer rarely gives up in this way, and when he becomes a litigant his conduct is in marked contrast. If, however, he has not much the matter and is coached, he is apt clumsily to overdo the part to be played and add fictitious complaints to the real ones. Many litigants are young women at a time when

they are undergoing sexual development and most likely to become hysterical. The excessive susceptibility in these immature subjects to powerful emotional stimulation during revivals, or when other religious influences are brought to bear, is quite likely in the same way to render them fit subjects for the railway psychosis. The same fixidity of attitude and absorbed expression which may be often recognized in hysterically melancholic girls frequently belongs to the states under consideration in connection with a number of ill-adjusted symptoms.

The terms *subjective* and *objective* of course apply on the one hand to symptoms which are felt and complained of by the patient, and on the other to those presented by him and observed by the outsider, and which are beyond the subject's control. Full value can be attached to the former only when there is some corroborative testimony, or when they are inherently consistent. While exaggeration need not of necessity imply dishonesty, the patient's powers of analysis and judgment are so often affected by his condition that his statements are apt to be unreliable. It is here that the experienced physician is often able to test the gravity of the alleged suffering, to approximate the nature and severity of pain, the extent of the loss of will-power, and the reality of the various disturbances of the organs of special sense. There has been so much uncertainty about the value of subjective expressions that it has been ruled upon on more than one occasion; that the objective indications are the only ones that can be taken into account and testified to by the expert. From a medical standpoint this is hardly fair, for the true expert should be able, even if he depends upon the patient's statements, to form a just opinion of their significance.

While what has been said about the abuse of the courts and the claims of dishonest persons is true, it is not the writer's intention to minimize real trauma and its results. Many serious forms of injury of the nervous system come daily under the notice of the adjuster and his advisers, the neurologist and the surgeon. Grave fractures, both of the skull and of the vertebral column, possible infection of the brain and its membranes, coarse injury such as laceration or contusio cerebri, dangerous forms of increased cerebral tension, possibly from hemorrhage, pressure from the products of inflammation; and injuries of peripheral nerves, all occur, and should receive the attention they deserve. Besides these we find psychasthenia, fixed ideas, hysteria, neuromimesis, general exhaustion of the nervous system, and neuroses and psychoses incident to depression of vital force in subjects so predisposed; finally there is a disreputable band of exaggerators. "substitutors," and more or less ingenious impostors.

CHAPTER I.

ACCIDENT ABOULIA.

SYNONYMS. — *Railway Spine — Spinal Concussion (Erichsen) — Traumatic Neurosis (Oppenheim) — Traumatic Neurasthenia — Traumatic Hysteria — Litigation Psychosis.*

EVEN before the appearance of Erichsen's book the relation of hysteria to certain vague forms of neurotic disturbance in connection with injury was recognized by the older writers. Brodie, Russell Reynolds, and Paget in England had much to say, not only about the effects of trifling injuries in certain neuropathic subjects, but the latter showed how closely hysteria might mimic real joint trouble.

Although Tardieu in France had for years gone on reporting cases, many of which resembled those collected and described by Erichsen as instances of a newly discovered affection, it did not occur to him to recognize a distinct traumatic neurosis. After the appearance of Erichsen's book in 1868 the subject attracted much wider attention, especially in England and the United States, and others published their experiences, among them Hodges of Boston (1880) and the writer, who had before this been called into court frequently to testify in railway cases, in 1878 and 1883. In 1883 Walton, of Boston, fully recognized the identity of the symptoms of the alleged traumatic affection with those of hysteria, and Page (1883),

a surgeon of the London and Northwestern Railroad, whose experience was extensive, analyzed and published his cases, to which allusion has been made.

In Germany Oppenheim (1889), Westphal, and Strümpell gave the disorder following trauma a distinct place of its own. Charcot in France, on the other hand, was not disposed to regard it as an affection by itself or one that differed from the familiar forms of neurasthenia and hysteria, in which conclusion Oppenheim's countrymen, Eisenlohr and Schultz, concurred. Prince (1898) explained the nature of the psychasthenia which gave rise to many of the symptoms, and has since done much original and suggestive work. Dana (1894) thought the condition was but neurasthenia with the added element of sprain, while Bailey (1894) was inclined to give full weight to the psychical etiology of the condition. Knapp and Clevenger inclined rather to Oppenheim's views.

Thanks to the voluminous and valuable contributions of Raymond and Janet, Lefébre, and many modern writers and teachers, there should be no difficulty in regarding the state of nervous suffering following a shock without serious or bodily injury as due to a mental rather than a physical disturbance, and one often suggested. The term *accident aboulia* has been chosen by the writer because it seems to be that most applicable to the condition manifested by a collection of symptoms of a hystero-neurasthenic nature, the chief of which is a loss of will-power. This is undoubtedly the result of auto-suggestion, and the creation of one or more fixed ideas in connection with a deception of the sensory centres. To understand its origin and significance we must consider the relation to

conscious and subconscious cerebration, the suspension of higher control, and the development often of a certain automatism following the repetition of an idea in the intellectual sphere until it fully dominates the conduct of the subject. In natural conjunction with such a disturbance are certain physical indices of ill health, but the objective expressions are greatly out of proportion to the subjective.

The terms *traumatic neurasthenia* and *hysteria* are referred to for convenience, because the derangements are symptomatized by states and symptoms which are conventionally grouped under these heads.

The departure from mental health proceeds from an accident, usually one of a vehicular kind, but the condition may follow a fall or the receipt of any shock or fright; and from many sources. What has been said before as to *preparedness* may be again referred to in showing that a knowledge of what may happen minimizes the danger of shock. In this connection reference may be made to the part played within the past few years by electric shocks, which are frequent causes of hysteria major.

Attention is further called to the fact that the psychosis may follow either immediately, or be slow in its appearance and progress, the patient responding quickly to influences in his environment. One of the best proofs of its psychic origin is that the subject at the time of the accident often goes about helping his injured fellow-passengers, and then returns to his home later to develop gradually his incapacitating condition. This tardy development is often erroneously explained by the assumption that the "nervous centres are injured immediately, but

that the excitement of the moment keeps the patient up"; but it is the author's experience that some of the most obstinate cases are those in which there has been neither a history of a dramatic or horrifying accident nor any apparent serious immediate shock or injury whatever, but in which the condition tardily and slowly grows in a manner already to which reference has been made. This view is also strengthened by the fact that the subject may be one of many others who are subjected to the same violence, but it is he who is seemingly alone prostrated. In this connection the question has often arisen whether or not the person was asleep at the time, and if so, whether this circumstance had any bearing. Many cases occur to the writer in which the accident happened at night or when the subject was asleep; and excluding those instances in which actual bodily injury was inflicted, there remain a number which subsequently became psychasthenic at a later period, there being an interval of comparative health, and in these suggestion played the major part.

Even if the early demoralization is not great, there appear to be additional factors of considerable importance, such as the thought of a suit, the persuasion of a "runner" or "ambulance chaser," and the sympathy and solicitation of friends in connection with the injudicious watching which in so many ways has to do with the awakening of hysteria and the establishment of a lowered physical tone. Day after day the victim broods upon his condition. Possibly he may be subjected to an unnecessary course of medical treatment and coddling, and the result is the formation of a carefully nursed central idea due to an unconscious and excessive stimulation of the

of Osler's personal cases had nothing to do with railroad accidents, that is, so far as direct injury was concerned, one being in a railway engineer who was unnerved and shocked after he had run over a child; the other, in a naval officer who had been exposed during the wrecking of his ship and who suffered great mental anguish. The second group includes the mixed hysterical cases, which are by all odds the most common; and there is a third in which, after a preparatory state of nervous suffering, symptoms indicative of a disease of the central nervous system appear. Osler does not believe that such a central invasion has occurred unless optic atrophy, bladder troubles, and signs of sclerosis are well established, indications either of degeneration of the lateral columns of the spinal cord or of multiple sclerosis.

The Neurasthenic Type.

Assuming that the expression of the so-called traumatic neurosis may be of the neurasthenic or hypochondriacal types, it is perhaps better, before proceeding, to consider the first, especially with relation to its exact meaning; for a mere glance at the literature of the subject will show how much confusion has arisen from the use of terms to express vague affections of the *neurasthenic form*. "Neurasthenia" was first coined by Beard, of New York, who, in 1869, endeavored to gather the symptoms of all forms of functional nervous weakness. The use of this word did not possess the merit of originality, however, for it was but a synonym for the more homely ones of "nervous exhaustion," "nervous debility," and "nervous prostration," and did not describe any state that had not been already fully pictured many years be-

fore by other writers. Bouchut, Sandras, Borguinon, Brachet, Andral, and Briquet in France and others in England—notably Skey and Hanfield-Jones—had pretty well covered the ground.

Even as far back as 1794, Pomme had given a graphic account of the *maladies vaporeuses*. Since Beard's time "neurasthenia" has become popular, and has been largely used in Europe to define what our German critics call "American nervousness"—whatever that may mean—although from the mass of reported cases in foreign literature, it would appear that there are at least a few neurasthenics abroad.

We should regard neurasthenia as a condition rather than an absolute disease, and one incident to fatigue of any kind or due to toxemia; or following many varying forms of depletion. The tendency to-day is to class it as a disease from many causes, having characteristic and striking features, and as a rule appearing in persons of congenitally weak organization. An acquired form—the *neurasthenie vraie* of Gilles de la Tourette—is recognized, which includes all those examples of simple nerve exhaustion in non-neurotic individuals. This, however, is not so common a sequence of trauma—that is, where it is persistent and manifested by a more or less complete breakdown—as is the constitutional kind, and the presence of hereditary predisposition is universally conceded to be the basis of the serious and prolonged disorder. "... It must be conceded that the hereditary taint is the all-important factor, and that constitutional disturbances, trauma, intoxication, or other conditions, are after all in the majority of examples only provocative agents. A sound nervous system is an inheritance that only the

most strenuous provocation can overturn for any length of time; and even when an upset has been accomplished, a restitution to the normal is soon obtained under favorable circumstances" (Berkeley).

The neurasthenia of to-day is therefore a disease of the ill-prepared and badly organized who are liable to go under through the operation of causes that would certainly not have much effect upon the stable and normal individual. It is admitted that it may appear at any age, and the "neurosis" of childhood, described by Maudsley and Clouston, is doubtless a form. Neurasthenia is hydraheaded with an etiology of the most comprehensive kind, trauma perhaps being of minor importance. It is associated in a large number of cases even with arteriosclerosis, and is common in presenile individuals as the result of overwork and breakdown.[1] This vascular degeneration may also be due to toxemic conditions due to alcohol, coffee (de la Tourette), tobacco (Lavillain), lead, or syphilis; or it follows cardiac and arthritic diseases, dilatation of the stomach (Bouchard), intestinal autotoxis (Smith and Herter), and lithemia. It is also a sequence of influenza, malarial poisoning, or toxemia from a variety of diseases.

Syphilis and gout, diabetes and nephritis, are all at some time manifested by the symptoms of neurasthenia, while sexual excesses of various kinds, and in fact any and all causes that exhaust and destroy the integrity of the nervous tissue, induce the disorder. It is therefore disingenuous to magnify the influence of trauma, which

[1] This relationship was recognized in 1794 by Pomme: "Plusieurs sont incommodés du battement des artères temporales et ont des sifflements d'oreilles, des vertiges, des frayeurs, des tremblements, des lassitudes, des douleurs, et des engourdissements dans les membres."

is but one of the least important causes, and persons of ordinary neurological experience will recognize the symptom complex, which is so often held to be due to an accident, while after all it is the familiar outgrowth of depraved states or bad habits. Dana, in speaking of traumatic neurasthenia, further says: "Careful research, however, often tends to elicit the fact that previous to the injury the patient was an alcoholic, syphilitic, or neurotic and perhaps already had the beginning of his alleged traumatic disorder. In no part of clinical medicine is a careful and searching examination and weighing of symptoms more urgently called for."

This somewhat prolonged consideration of the general etiology of ordinary neurasthenia is perhaps necessary when we bear in mind the tendency in medico-legal proceedings to ignore the ordinary clinical features of an affection dependent upon so many different things.

Symptoms.—After an accident when the honest patient consults his physician, his recital of symptoms usually includes a long list of subjective ill feelings in which disturbances of sensation are the most important and persistent. While these are vague, and vary greatly at different times, a peculiar headache and backache are more or less constant. Physical weakness, functional atony of the digestive organs, insomnia and mental depression or unrest figure. The patient's psychic attitude, which will later be more fully considered, is very conspicuous, and is sometimes in marked contrast to a previous condition of mental health, although those who are familiar with his history are probably aware of other occasions when, under the effect of inconsiderable stress, he has not shown an expected resisting power, and has had "nervous prostra-

tion." He shows his weakness by different kinds of indecision, and therefore finds it difficult to reach a conclusion and act upon it. Sometimes he is emotional, bursting into tears without apparently sufficient reason, or showing his demoralization in other ways which may sometimes cause his friends great anxiety. There is a varying degree, not only of physical weakness, but mental as well, and the former is due to insufficient muscular innervation, and its psychic character is evident. The hands are tremulous and the slightest exertion or *idea of required effort* may produce a more or less general agitation or surrender. What would be an inconsiderable effort for another person produces in him prompt and disproportionate fatigue, which begins even early in the day, or even after a good night's sleep. The patient therefore gives up most of his ordinary work and so far as possible seeks rest, which is usually insufficient to relieve the constant tire of all the muscles, but especially those of the extremities. There is never, even in serious cases, what might be called paralysis, but only a functional weakness or an amyosthenia, the electrical reactions being conserved. Sometimes he takes to his bed, making no effort to use his arms or legs, although he might if he so cared, *or retain the power to believe that he could.*

In some cases there is more or less general rigidity of a light grade which is modified by changes of temperature, thus resembling the phenomenon which is observed in certain kinds of depressive insanity. This, however, is not a familiar symptom, but is seen sometimes in protracted cases. In a certain proportion, especially if they be of the hysterical type, the reflexes will be found to have undergone a change, there being an increase of the knee-

jerks. The appearance of the confirmed neurasthenic is largely one indicative of malnutrition, and this undoubtedly follows the changed conditions of life and habits. Absorbed by his fears and worries, it is with difficulty that he is made to take a sufficient amount of proper food; and we therefore find a resulting pallor and general asthenia, with loss of flesh and constipation. Some patients of this kind, however, remain comparatively well nourished, and even the most wretched are apt to recover their ordinary health and spirits when the distressing worry is removed.

THE MENTAL CONDITION.—The mental condition of the neurasthenic is notably one of depression and despondency; and if at all confirmed, there is a striking apathy, which is shown in listlessness and the slowness of his movements, which in some measure are due to the actual asthenia, and in greater part to the disinclination to exert himself. As Mathieu says: "It is less a symptom than a tendency to lowering of tone in the commissural union of different spheres of cerebral activity. It is in truth an enfeeblement of the personality, a diminution of the co-ordinated reactions which constitute the *ego*. The lowering of volition is the most important phenomenon." There is a condition of doubt and an irresolution which is nearly always shown about the simplest details of every-day life. To this belongs the development of morbid fears of a familiar kind, which in a measure affect the individual's responsibility, rendering him incompetent to exercise his judgment, so that he becomes helpless and restless, or is worried by his own inability to come to a conclusion, or even to meet the simplest demands upon his judgment and volition.

In the cases in which indecision is a feature, it is not often that it arises to the dignity of a genuine or a continued "folie de doute," but sometimes insistent ideas are so strong as to tincture the whole conduct.

CASE I.—A person who had fallen from a street car and had subsequently, under improper influences, lapsed into a condition of morbid introspection and general ill health, consulted the writer among others. This man became so possessed with his inability to go near the street where the mishap occurred that he changed his place of abode and took lodgings near my office, which was in a different part of the city, so that he could be near me without approaching the scene of the accident. Nothing could induce him to go near, much less cross the road even with an attendant, and serious urging simply precipitated a childish and tearful state. On one occasion without his knowledge he was driven across the street several times and subsequently told of the proceeding, but even the accomplishment of this did not remove the morbid fear and doubt of his own capacity, and the dread of an impending calamity should he make the attempt voluntarily. Subsequently, however, he recovered entirely after a year spent abroad.

Obsessions of this kind are common, and another neurasthenic, now under the writer's care, has a constant dread that he is being injured or made worse in the most improbable ways. One of his chief complaints is that he has been exposed to syphilis by shaking hands with this person or that, or by smoking a cigar which has possibly been handled by one who is perhaps infected; and for weeks he has neglected to wash his eyes, fearing that they may become the seat of disease from contact with contaminated water. The physical appearance of this patient, largely induced by his own disregard of soap and water, and his red eyes, which are the seat of a blepharitis —the result of frequent rubbing and accumulated dirt— would be likely to impress an ignorant person with the

idea that they were all a part of a serious illness. The patient is often irritable and resents his wrongs. It has been said that these subjects are occasionally impelled to commit suicide as a result of their depression (Defendorf, Hirt), but of such cases the writer is unaware.

Sometimes there is a condition of mental erethism which is expressed in active ideation, and the subject is impressionable and irritable to a degree. The evolved ideas, however, are closely connected with the subject's condition and take their coloring from his suffering. It must be admitted that emotional instability of a depressed kind is the rule, and accounts for the lachrymose tendencies; there is also a kind of morbid timidity, of which the case just related is an illustration, and the patient dreads to do anything to increase his alleged serious condition, and frequently comes to the physician for reassurance just as do the syphilophobics and other sexual hypochondriacs. It is common for these patients to visit the doctor several times a day to show him an imagined change in color, a spot of eczema, or a pimple, or some equally trifling thing which is alleged to be a new development. These symptoms are highly characteristic of the hypochondriacal type. While the power of attention is distinctly weakened in traumatic as well as other forms of neurasthenia, memory is as a rule unaffected, which, however, is not the case in hysteria. (See Traumatic Insanity.)

The *facies* of the neurasthenic is most striking; in fact it may be looked upon in obstinate and protracted cases as something that points very strongly to the possibility of a mental trauma (but not necessarily a serious one) and perhaps an impending litigation. It can be

compared more properly to the expression of the mer
cant one sees so much of in Latin countries. There is
habitual drooping and flaccidity of most of the lo
facial muscles, while the brow is corrugated, sometim
unilaterally—as depicted by Kirchoff in his plates of
sanity—or traversed by numerous wrinkles. Those w

FIG. 1.—Facies Mendicans.

remember one of Duchenne's cuts showing the results
facial electrization will appreciate what is meant, for t
is so persistent as to suggest the existence of an ev
present mental image of pain rather than suffering whi
actually exists. This expression is more often seen
litigants whose cases are in process of arbitration or su
and is as a rule an unconscious exhibition and therefo
not to be controlled; it does not by any means imp

however, that there is a corresponding amount of suffering.

CASE II.—H. S——, aged 50. The alleged accident occurred July 30th, 1896, and according to his story the car started while he was getting out, throwing him upon his back in the street. He remained unconscious for several hours (?), and when he recovered found that there were bruises upon his head and right elbow. After a bad night he awoke the next morning suffering from frontal pain and was quite dizzy and tremulous. During that day and subsequently there was much pain in the back and this increased. He walked upstairs with difficulty, and on the 28th of August sent for his physician, who has treated him ever since. His power of application is so affected that he cannot read or perform any mental work without becoming dizzy. According to his statement it sometimes takes him four or five hours to read one page, but this is probably an exaggeration. When seen several months after the accident he appeared to be unsteady and tremulous, the oscillations of the tremor being about six and one-half to the second, and both hands were affected when he was excited. The pupils were even and reacted normally; there was no contraction of the visual field, and his hearing was not dulled. There were no paralysis and no analgesia. His skin was moist, and he perspired very readily, even in a cool room. Although his physicians had pronounced his symptoms to be due to some form of sclerosis, there was no difficulty in making the diagnosis of neurasthenia of a familiar kind; and subsequently, after settlement of the case for a small sum, he recovered entirely. In this patient there was a great deal of mental tension, and it was evident that the impending suit had added to his anxiety and uneasiness.

Insomnia.—Sleeplessness is one of the most familiar symptoms of all forms of neurasthenia, and is usually complained of in that under consideration. It is due to many things; and while generally resulting from an irritable and badly nourished brain, which is unduly susceptible to irritation from without, it is frequently the product of a fixed idea. In other cases possibly much of the

wakefulness of the neurasthenic arises from his failure, either through inability or fatigue, to take the necessary exercise, and as a consequence there is more or less toxemia, due to retained waste material which is not excreted. It is rare for the pain which such patients experience to keep them awake, for as a rule the headache and the other sensory disturbances are relieved by the supine position and rest. There is ample reason to believe, and many cases support such a conclusion, that a great deal of the insomnia of neurotic patients originates in, and is fostered by an obstinate and continued belief that sleep is impossible.

Janet reports several interesting examples of more or less prolonged sleeplessness of this kind, and one, a woman of thirty-seven, complained constantly of being very fatigued and sleepy *because she could not sleep at night.* She remained extended on her bed, with her eyes open, tossing restlessly from side to side for many nights, and no one could see that she slept. She was watched at the Salpétrière by the patients, nurses, internes, and others; and so far as their testimony was concerned it does not appear that she actually slept for a period of two years. Many cases of this kind are familiar to the writer, and in some the simplest kind of suggestion—the most efficacious being contact of some kind—would effectually overcome the insomnia. As a rule the wakefulness of these patients occurs during the early part of the night, and others cannot sleep after a very early hour in the morning.

Sensory Symptoms.—Two kinds of pain are usually complained of by neurasthenics—a peculiar headache (cephalalgia), or a backache (rachialgia). Their frequency

in other neuroses in which the general nutrition is lowered, and in which more or less cerebral and spinal ischæmia exists, suggests that in the present instance they have some such causation. The headache, which is an early and harassing symptom, occurs in the majority of cases, and Lafosse has found it in forty-one out of forty-five cases. Like all anemic *headaches*, that of neurasthenia appears in the morning and improves toward night when the recumbent position is sought. It is not modified by the full or empty condition of the stomach, but is aggravated during digestion. It is often paroxysmal, and may be attended by flushing of the face and hyperemia of the blood-vessels of the surface, the temporal arteries being distended. It is probable that the feeling of head tension, of which complaint is often made, has led it to be compared to the pressure of a helmet. There is also bitemporal pressure, which the patient compares to that which might be produced by an encircling iron band. Sometimes the pain extends down the back of the neck to the shoulders. Like that of migraine it is usually unilateral, but there is neither a chilly stage nor the nausea of the latter. It is associated with *muscæ volitantes* or flitting visual spots, illusions of sight and hearing, one of the latter being a peculiar subjective crackling or explosive noise first described by Searle many years ago. The *backache*, when not due to sprain or injury, is sometimes very distressing and irregular in its situation and character. Although the patient may complain of deep pain, there is ordinarily a lively superficial hyperesthesia, the slightest touch causing as much discomfort as forcible pressure, if not more. The skin over the vertebral spines is especially sensitive, and the bony eminences themselves

are more tender than other parts of the vertebra that may be subjected to pressure. In women the seventh cervical spine is especially intolerant. The ideational character of much of this pain may be demonstrated by remitting the pressure, without the patient's knowledge, over a point where great distress has been caused, and applying it at some new point, to which his attention is directed. Although the same force may again be applied at the original spot, the subject will declare that the most pain is at the fresh point of contact where the finger may barely touch the skin. There is some disinclination to move or twist the body, but none of that seen in lumbago, sprain, or more serious and deeper troubles, such as meningitis. Sometimes complaints are made of general muscular soreness. Vague sensory disturbances with no adequate explanation are common in neurasthenia, which are known as dys- or paresthesia. These consist of numbness, tingling, formication, and other disorderly perversions of sensibility that may be localized or general, and are rarely distinctly unilateral or defined as in hysteria. The patient may claim that the contact of ordinary clothing produces great discomfort and aggravates his suffering, and is often fussy and imaginative. Occasionally the tongue may become the seat of a dysesthesia, which may be associated with a refusal to eat for a long time, and as a result the patient suffers resulting malnutrition.

Intercostal neuralgia and *coccyodynia* are common, and Huchard and Weil have described fulgurating pains that have resembled those of tabes. Coccyodynia is very frequent, and is often exaggerated by the patient, who is usually a woman and who complains of many derange-

ments of her pelvic organs. Sometimes the subject whose complaints are the most frequent, may, while the attention is diverted, sit squarely for a long time in one position upon an uncomfortably hard seat in court, absorbed in the proceedings without showing any sign of distress or making any change. In women it may be an exceedingly painful symptom of trauma, and may persist for a long time, as it does under other circumstances.

The study of the painful manifestations of neurasthenia from a psychic standpoint will explain the origin of much of the pain which is so often imperfectly understood, especially where there does not appear to be any sufficient original injury. The torturing introspection, to which allusion has been made, has much to do with the complaints of the individual, and his constant tendency to call up disagreeable mental images. Prince has invented the term *algonesia* (pain generation) to define this process by which the neurasthenic brings into the higher field of consciousness painful ideas that have perhaps been formed at some distant time. The instances are familiar enough when trivial injuries have produced mental impressions that have obstinately influenced the recipient for years. The writer has seen a patient to whom in childhood a leech was applied, and she is emphatic in her avowal to this day that she still has pain at the precise spot. The unstable individual is often prone to connect certain peripheral sensations with those of a grosser kind; pressure on the umbilicus, for instance, causing pain at the back of the neck or at some remote point. Neurotic patients who receive trauma in this way learn to treasure and dwell upon painful impressions which were originally connected with some slight bruise or

strain, and later become dominant fixed ideas; so that an old and insensitive scar, quite removed from any sensory nerve, may become the seat of imaginary pain. "The phenomenon of producing pain in one region of the body by a slight irritation (as by scratching) of the skin of a distant area is not unfamiliar; likewise the intense pain in the back sometimes excited in neurasthenics by simply tapping the patellar tendon. The writer is familiar with one case, a man in whom during mental fatigue the forced effort of silent reading caused an intense tickling in the larynx. . . . In normal individuals the excitation of pain areas by muscular effort is of necessity, on principles of evolution, uncommon; but pathologically, especially in neurasthenia and hysteria, examples of this are of common experience" (Prince). To the patients upon whom sensory images act in this way, Prince has applied the terms "visuals," "auditives," "olfactives," etc., with reference to the kind of impression that has been recalled. In a normal condition many individuals are annoyed by reminiscences of this kind, which are forced from the subconscious field into a higher mental sphere, and always depend upon the formation of an early disagreeable association. These may not rise above the line of idiosyncrasies, but in neurasthenic and hysterical subjects possess a graver importance. Recalled or unconsciously projected sense memories, when at all intense, often form the basis of quasi-hallucinations. What is a mere fancy or eccentricity in one, becomes a false perception in another; and in chronic neurotic invalids the complaint of the subject is often regarded as neither absurd nor improbable, because it is consistent with popular and conventional belief. The declaration of the imaginative neurasthenic

does not therefore seem unreasonable to the layman, who often cannot understand how any one can complain of pain and not have it; while to the psychiatrist, what may be the product of a morbid mental process is perfectly clear. The term *akinesia algera*, or pain palsy, may be spoken of in this connection, as it is used to express a form of helplessness which amounts to a paralysis, and is induced simply by the fear that intense pain will be caused by any muscular movement, as may be the fact. This condition cannot be considered in any other way than a psychopathic connection, and it undoubtedly arises in the manner above alluded to. In some patients the mere idea of taking food produces pain, and the same complaint is often associated with the use of one of the organs of special sense.

Nervous mimicries are occasionally found as traumatic neuroses, and it is common to find not only pseudo-joint affections, but a number of inconsistent painful expressions when the fear of moving or required exertion is present. Such a case was that of Mr. R——, seen by the writer about ten years ago.

Case III.—This gentleman was a rich retired merchant who, after having gratified his desire as a collector, or rather an accumulator of art objects, passed his days in idleness without sufficient resources to keep his mind busy. One night upon getting up for some purpose he came into light collision with a piece of furniture, and although there was no abrasion over the spot, which was limited to the third dorsal spine, or pain at the time, he sent for his family physician, who, instead of reassuring him, ordered him to bed and made sundry applications. After this his "pain increased and became unbearable," and a few days after he "noticed a growing loss of power in his legs." At this time he consulted another physician, who told him that he "was in danger of inflam-

mation of the spinal membrane, and should keep quiet." Although it does not appear that he had any actual paralysis or any symptoms whatever except those of a subjective nature, he developed a fear of exertion, and a morbid concentration which kept him absorbed, and the occupation of invalidism took the place of the earlier fad. He had a suite of rooms at an expensive hotel, which were some distance from the dining-room, and he procured a wheeled chair with which to propel himself. Subsequently he discarded this and had a much more conspicuous small cart made with low wheels, which he used in the crowded corridors. During all this time, according to the story of his wife, he was able to move his legs and walk when he chose in his own room, but was always apparently helpless when in the presence of other people. Within the next year he chartered a special car and went from city to city consulting many of the available neurologists of repute, who, as a rule, took a serious view of his trouble, some of them diagnosing an actual affection of the cord, and others regarding it as a hopeless psychopathic condition. He complained always of the persistent localized pain, and through reading medical books after a time enlarged his list of symptoms. When I saw him at the end of the third year of his invalidism he was in bed supported by a cumbersome metal and leather cuirass, which was declared necessary to enable him to sit upright for a few hours daily. When this was removed by the two trained nurses I discovered no evidence of vertebral disease. The skin over the four or five upper dorsal vertebræ was red from friction, but no projection and no real rigidity were to be found. He complained of pain when pressure was made over the alleged spot of disease, but when it was made elsewhere he changed the situation. The legs were flabby from disuse, but there were no atrophy and no morbid electrical reactions. The reflexes were slightly exaggerated. There was no loss of sensation of any kind, nor retinal anesthesia. His manner was martyr-like and suggestive of a long-standing hypochondriasis, and being unable to find any symptoms whatever that were definite, I felt sure his case was a neuromimesis and treated it accordingly, with the result that in a few weeks he was up and about, a mental revulsion having taken place. He discarded his crutches, discharged his attendants, and ceased to complain of pain or anything else for the first time in several years. Thereafter his chief pleasure was in

the retina other than of a functional kind are never found, and the absence of atrophy of the optic nerve may be considered an important diagnostic fact in those advanced cases which are supposed to be connected with organic disease. Should hyperesthesia of the organs of special sense exist, it is nearly always a purely irregular psychic state which leads the individual to call up false memories of previous sensory impressions, or to associate them improperly.

Neurotic though comparatively normal individuals are constantly prone to associate some new and fanciful sensation with a disagreeable impression received at a remote period; but neurasthenics carry this to a morbid extreme, practically surrendering to their new troubles, and declaring that various sights, sounds, tastes, and smells are so disagreeable to them that they prefer to isolate themselves and undergo self-denial to a damaging degree. These subjects are also annoyed by ringing in the ears and other subjective noises. The pupils do not show any constant change, but are usually dilated and sluggish. It has been claimed that inequality has been found, but this must be regarded as quite apart from the disease, and is probably a congenital or occupation defect. Possibly this mistake may also be made in paresis in which a neurasthenic début is not at all uncommon.

Vertigo.—Vertigo is a familiar and disagreeable symptom of neurasthenia, and varies from simple dizziness to a serious condition, which causes the patient great alarm. He may even be unsteady, or go up and down stairs with difficulty, but not in the way familiar in tabes and some other spinal diseases. It may follow or be associated with headaches, or occur after inconsiderable exertion. It

often attended by tachycardia, and relieved when the patient lies down.

Motor Symptoms.—Fatigue finds an important place in the symptomatology of the condition, and is as often a psychic manifestation as an actual tire due to the effect of muscular toxemia, which belongs to the ordinary form of exhaustion. Undoubtedly there are cases in which the very inaction through the fear of exertion so interferes with the excretion of waste body products that the retention of toxins acts injuriously in this way. An analysis of most cases will show that the fatigue is of mental origin. What is known as the "feeling of fatigue" exists rather than an actual physiological condition, and is closely connected with emotional activity. Not only will an inconsiderable emotional excitement prostrate the subject, but a severe shock will, as every one knows, lead to complete inhibition, so that the volition is suspended, for a time, when there is virtually a functional paresis. In many of these cases through diversion, suggestion, or the necessity for action (possibly through a selfish need of the subject), this feeling of false fatigue is very easily overcome. In neurasthenics there is never what may be called true paralysis; and even in the occasional rare cases in which the will has been suspended for a long time the apparent lifelessness and rigidity of the extremities is after all an ideational paralysis, which is curable.

Tremor.—There are but few cases in which tremor is not present to some degree, and though constant becomes more noticeable when the patient is worried or excited. Unlike that of multiple sclerosis or hysteria, it is not increased by the attempt to perform any particular muscular act and is not cumulative. The oscillations are about

five and a half to six and a half per second, and less frequent than those of Graves' disease, where there are in addition goitre, as well as tachycardia, and various neurasthenic symptoms. Some cases of this affection are traumatic in origin and may closely resemble traumatic neurasthenia; but usually the element of time as a factor in the development of symptoms should make the diagnosis easy.

Other forms of tremor with which that under consideration may be confused are those of alcoholism, paralysis agitans, and senility. The fact that in most of these the agitation is a gradually extending one, and is associated with other distinguishing symptoms, should make its nature clear. In alcoholism the tremor is finer and worse in the morning, while in paralysis agitans there is nearly always the apposition of the ball of the thumb with the distal phalanx of the index finger. While the oscillations of senile tremor are from four to six a second, it is more constant than that found in neurasthenia, and there should be no difficulty in distinguishing it unless the patient be presenile, which is rarely the case. In some neurasthenics the tremor involves the tongue and lips, so that speech is more or less embarrassed, and occasionally a mistake is made in a diagnosis of paretic dementia.

The *reflexes* are of little importance in neurasthenic states. In these as well as other affections in which the cerebral inhibitory power is diminished, the deep reflexes are usually more or less exaggerated, and in hysteria particularly to a conspicuous degree. Although unilateral exaggeration may be found, and is regarded usually as a symptom of central disease, I have found it once or twice

in cases of this kind in which there was clearly no degeneration, as a phenomenon.

The reflexes are never lost, and in this connection it must be borne in mind that in a small proportion of perfectly healthy persons it is impossible to evoke the knee-jerk at all. Although Preston and Bailey have claimed to have found the ankle clonus in hysteria, it is never present in neurasthenia, and even in the former disease when it is seen there are probably overlooked organic lesions.

Circulatory Disturbances.—The most important objective cardiac derangement is recognized in acceleration of the pulse, this *tachycardia* in some cases being remarkable. It is not unusual to find an average pulse of 120, and after inconsiderable excitement it may reach 170, while the arterial tension is lowered. In some cases we find irregularity and intermissions. Symptomatic *brachycardia* is unknown.

Vasomotor disorders consist not only of obstinate flushing of the surface, but there may be spots of cutaneous hyperemia, or peripheral coldness and lividity. The condition of the skin found in certain cases of meningitis, and described originally by Trousseau, may exist, so that when the surface is lightly scratched or drawn upon there is a resulting red mark or *tache*, sometimes with elevation, which corresponds to the particular contact, and is known as dermography. This is often more marked in hysteria, and has been regarded in other times as a supernatural manifestation by credulous religious hysterics; it has also formed the basis of many a conjuring trick. There is often profuse sweating, which occurs even without exertion in the coldest weather.

Subjective sensations of cold and heat are common as is palpitation; and in inactive cases some of the cyanosis, so characteristic of old spinal disease, may be found, especially if there is rigidity. In rare cases hemorrhage and hematemesis take place without any apparent causation or sufficient injury in connection with circulatory changes.

CASE IV.—Such a case was that of Mr. W. W. R——, seen in consultation by the writer with the late Dr. C. E. Lockwood, of New York. Mr. R—— while travelling from Washington to New York on a train of the Pennsylvania Railroad on the morning of November 30th, 1881, had occasion to enter the water-closet of the car. While in a standing position a collision occurred with another train, and he was thrown forward and then backward, striking without great force the edge of the cover of the water-closet. He vomited blood mixed with bile for about two hours, suffered much from pain and faintness, and was bathed in a cold perspiration which saturated his underwear. He then came over to New York, and feeling a craving for food ate some, which he soon brought up. Upon his return to his boarding-house he endeavored to write several letters, but was compelled to give up and go to bed, owing to the pain in his back. When seen December 1st he was suffering from general hyperesthesia over the whole body, but especially over the arms, legs, abdomen, and back, severe aching pains in abdomen and back, and was unable to move from the recumbent position without nausea and retching. He had passed his urine, and there was no paralysis or loss of sensation, and there had been no movement from the bowels. For the next few weeks he continued to have subjective feelings, such as a slight cramping in his toes ("as though one were crossed over the other"). There was gastric irritability, and he passed his urine only once in twenty-four hours, and then only eight ounces. An examination of the same was negative. His pulse, which was before regular and not particularly rapid, began to intermit, there being from three to ten intermissions a minute. He was dull, and his sleep was light. There were some confusion and inability to concentrate. Further subjective sensations were those of tingling or

the finger-tips, prickling, and what he termed a "buzzing sensation in fingers and toes," twitchings of the muscles of the calves, especially of the right leg, burning, aching sensations in the back, especially that portion between the shoulder blades and over the lumbar region. Subnormal temperature, but not below 97° F. at any time. He stood and walked with difficulty, and had to be supported; the knee-jerk in both legs was increased; the pupils were unequally contracted, but this was found to be an old condition. Upon two occasions, it was subsequently learned, he had vomited blood without any seeming effort.

A short time after this, during the year 1882, his case was settled, and he gradually recovered, so that he was able to return to his duties as consul in a Central American city. There was a gradual subsidence of his nervousness and bad symptoms, his pulse became regular, and most of his subjective feelings disappeared. It should be stated that for many weeks the urine was irregularly passed, sometimes not more than once in thirty-six hours. We had no reason to believe that he had an internal injury, and the vomiting of blood was regarded as the result of a vasomotor disturbance.

It has been stated by Dana and others that in neurasthenia the amount of hemoglobin is not lessened. This may be true in some cases, but it cannot be disputed that in those in which much malnutrition exists, there is not only a decided decrease in the percentage of the coloring matter of the blood, but the red corpuscles are notably deficient. In women, after shock, the menses are sometimes suspended for months, and in traumatic neurasthenia there may be a permanent irregularity, or at least one lasting until the mental uneasiness and suspense are terminated.

Disturbances of Digestive Functions.—What is popularly known as "nervous dyspepsia" is a natural sequence of trauma. Sometimes this is brought about by the patient's state of mind, or by the enfeeblement of the

organs of digestion, which are insufficiently innervated and the symptoms are varied and are what may be ex pected in analogous cases from other causes than trauma The derangement may be both gastric and enteric, an the symptoms may be those of both. There are generall present an atonic condition, want of appetite, or one tha is capricious or at times even ravenous. The digestion decidedly slow, and as a result there are often flatulenc acid eructations, or actual regurgitation of food, epiga tric pain, colic, and general distress. There is in som cases an increase in the amount of chlorhydric acid i the gastric juice, and sometimes a diminution, althoug in this as in other forms of neurasthenia the latter is a to be the case. Intestinal autotoxemia, shown by an i crease in the amount of indican excreted; diarrhe which is usually of an irritative character, or constipati naturally connected with a torpid condition of the low bowel, are all likely to be present. The amount of uri is scant, and, as in the case just reported, may be pass irregularly. Instead of the proportion of uric acid urea being from 1 to 45 or 1 to 60, as it is in health, it reduced from 1 to 30 or 1 to 40 (Dana). The phospho acid is increased, and sometimes the urine contains trac of sugar, but never albumin, unless there is arterial sc rosis, which cannot be said to have any direct connecti with the trauma.

CHAPTER II.

ACCIDENT ABOULIA (THE HYSTERICAL TYPE).

As has been said, the association of hysteria with neurasthenia is common in those persons whose symptoms develop after a railway collision or other accident. While of course it does not follow that neurasthenics must be hysterical or *vice versa*, the condition under consideration is, as a rule, one of general ill health with hysteria added thereto. Ordinary hysteria is so protean in its manifestations that it would be a difficult task to elaborate them all, but for convenience the excellent division of Fraenkel may be quoted: "From a general clinical point of view hysteria could be separated in three principal groups, which, however, like all things in nature, are not marked by fixed boundary lines, and can show many interchanges and mutual displacements. As belonging to these groups can be enumerated: (1) Predominantly mental forms, hysterical psychoses with more or less pronounced somatic symptoms. (2) Predominantly cerebro-spinal forms. Symptoms of this group are mainly composed of phenomena of irritation or paralysis of motor or sensory apparatuses supplied by the cerebro-spinal system (monoplegias, hemiplegias, paraplegias, tremors, contractures, ocular symptoms, etc.). (3) Predominantly splanchnic forms. The symptoms of this group are composed mainly of phenomena of irritation or paralysis of motor or sensory apparatuses supplied by the splanchnic or sympa-

thetic nervous system (vomiting, constipation, diarrheas, meteorismus, tympanites, phantom tumors, ulcerations, edemas, etc.)." The so-called traumatic hysteria is rarely expressed by symptoms of the third division, but more often by the first two, especially the first, for it, like traumatic neurasthenia, is a psychosis rather than a neurosis with which we have to deal.

The symptoms that belong to the hysterical type of the disorder under consideration are mainly those of a cerebro-spinal kind, and in a rough way at times superficially resemble those of actual cerebral or spinal disease. It now remains to describe the picture that is so familiar in subjects of traumatic neurosis, and particularize the symptoms. As has been said, there is quite apt to be a condition of preparatory ill health which varies greatly, and is not impressive; but this may be entirely absent, the symptoms sometimes appearing suddenly. However, when there is a group of symptoms they commonly have a neurasthenic basis. What has already been said of the genesis of the latter disease may be repeated. Hysteria is, perhaps more than neurasthenia, an affection with a vicious constitutional preparation. Many of the subjects present physical defects suggestive of imperfect development, and are liable to characteristic disturbances. And their degeneracy shows itself in an unstable emotional temperament, poor judgment, and poorer will power; precocity, sexual irritability or perversion, moral delinquency, morbid appetites, the formation of drug habits; and physical anomalies. Trophic alterations of the central incisors may be found among hysterics, as well as certain mental disabilities, to which reference will be made hereafter.

ria of any kind is noted for the eccentricity of toms, their peculiar sudden appearance, and equally prompt disappearance. Among these osthenia, suddenly developed paralysis, spasm or, and irregularly distributed cutaneous anes- ich affects the organ of special sense, as well as he deeper parts of the body; hyperesthesia and ia, besides certain *bizarre* disturbances of respi- gestion, and micturition.

R DISTURBANCES.—Amyosthenia or muscular often precedes complete paralysis, or the latter lenly occur, which ule. It is often y an unexpected ower, which, how- mporary, and may patient suddenly o the ground, his ving way; to let he may have in , or to collapse in ier way. Hysteri- ysis is ordinarily to the voluntary especially those of mities, although it hat the muscular

FIG. 2.—Hysterical Paralysis. (Raymond-Janet.)

the intestines, as well as other involuntary mus- eeper parts, may be sometimes involved. Both remities (paraplegia), one upper and one lower on the same side (hemiplegia), or sometimes member, muscle, or group of muscles (mono-

plegia) may be involved. The *hemiplegic* form is perhaps the most common, especially in women, and at times closely resembles true hemiplegia of a more serious kind, dependent upon a lesion of the brain or spinal cord. There is, however, none of the involvement of the facial muscles that is found as a symptom of the first variety, and the left side of the body is more often affected than the right.

Babinski gives a diagnostic sign which helps in differentiating between hysterical hemiplegia and that of an organic nature. This is obtained by making the subject lie on his back with his arms folded in front, when he is told to rise to a sitting position, his arms remaining folded. When this is attempted it will be found that if his paralysis is hysterical, the extremity will remain flaccid and parallel with its fellow; but in the organic form the affected limb will be flexed at the thigh, and extended at the knee and raised.

Paraplegia is said by some writers to be uncommon, but this is a mistake, especially in the hystero-traumatic examples. The paralysis of one extremity is apt to be mistaken for a peripheral kind due to neuritis, or some other form of disease causing nerve degeneration, which disconnects the peripheral muscles from their source of central innervation. All forms of hysterical paralysis are characterized by the flaccidity of the muscles and by the *apparent* profound loss of power. There is evident greater helplessness seemingly than in true organic paralysis, especially hemiplegia of central origin; for there are few cases of the more serious affections in which the patient is not able after a short time to make some movement. In fact, the muscles do not act, simply because

not directed to do so. One is
ed immediately by the limpness
limb; and when the patient
the paralyzed leg and foot are
ing around, as in cerebral par-
hen the toe touches the ground,
dragged along, the whole side
foot perhaps scraping the sur-
In the paraplegic form the feet
tally kept in contact in a like
and trailed in the same way
.

re is not only the objective ap-
e of great weight, but the patient
mentions it as one of his disa-

has been said, an important diag-
point is that the face is never
aralyzed, but mistakes have been
by those who have been led
by an asymmetry due to a cer-
nd of cramp or tic, which may
ateral and produce a distortion.
ongue, which in true cerebral
egia usually points to the side of
on, when protruded by the hys-
patient inclines to the paralyzed
ut this is not because of par-
but as the result of a lingual

other diagnostic sign referred to
na is that when the hysterical
egia follows a blow to the head,

FIG. 3.—Gait in Hysterical Paralysis. (Cinematograph by Author.)

the latter has been inflicted on the side corresponding to the paralysis, and not on the other, as would be the case were it the cause of a cerebral lesion resulting in paralysis. As has been said, the condition of the muscles is one of flaccidity, and should there be atrophy and contracture, these two appearances would differ very greatly from those found in central disease, the atrophy being a result simply of disuse rather than a destruction of the large cells in the anterior columns of the cord, while the contractures are not dependent upon a descending pyramidal degeneration.

Such contractures, like the atrophy found in association with paralysis, are sometimes features of inaction, and best seen in those subjects in whom a fixed position has been maintained for a long period. Unlike a form of contracture to be described, there are sometimes left a deformity and a residual shortening, even after the paralysis has been cured. The fact that hysterical paralysis is associated in most cases with a peculiar loss of sensation and other stigmata demonstrates its peripheral and functional character. Through the use of the induced and galvanic currents we learn that though quantitative response to electricity is perhaps impaired—that is, that the muscles do not contract to minimum currents, there is no "reaction of degeneration." The integrity of the nerve connecting the muscles with the nerve centres is therefore preserved. A peculiar hysteroid motor disorder, in which certain voluntary acts are possible and others are not, is known as *astasia abasia*. In this condition the patient, when recumbent, can freely move and kick his legs, but in the upright position is unable to walk or even stand; the muscular power therefore is not gone, but in-

rvation is perverted. In such cases there is rarely an-
thesia. Of fifty recorded cases nearly one-half were be-
ved to be hysterical, and the writer has seen one case in
ich it followed a railway accident, complete recovery
suing in a few months. This condition suggests an-
ner in which the patient can only do certain things with
e upper extremities. He can raise his arm perhaps,
t cannot write, or perform other delicate acts.

Spasms and Contractures.—All hysterical patients are
t at times to present contractures of widely different
nds. While many of these are clearly the result of
ental perturbation, or follow causes which are psychic,
sometimes happens that after an insignificant injury, a
ck, twist or puncture perhaps, an extremity may become
e seat of a spasm or contracture; and in the latter case it
ay obstinately endure for some time, perhaps suddenly
sappearing after a second shock or profound mental
pression, or through the agency of hypnotic suggestion.
ysterical contraction may sometimes be overcome by
e Esmarch rubber bandage, and usually disappears dur-
g the administration of ether. While grand hysteria,
it is called by French writers, is apt to be sympto-
atized by extensive tonic or clonic contractures, perhaps
recurrent nature, the cases that interest us most are
ose in which a limited contracture, clearly traceable to
uma, involves perhaps an arm or a leg. They are often
so peculiar a character as to be recognized at once by
per tests without much difficulty. The form of inac-
n contracture, which involves the paralyzed extremi-
, to which reference has been made above, occasion-
resembles very closely certain serious kinds of central
ease, and is often mistaken for that of the so-called

combined sclerosis following hysteria, amyosthenia, found anemia, and prolonged decubitus, or Thom disease; but the tremor is peculiar. Those co tures involving perhaps the fingers or hand, toes or

FIG. 4.—Hysterical Contractures. (Richet-Preston.)

have the explanation referred to above, and the mity may take place after a scratch or wound whi insufficient in itself to produce neuritis and essentia tracture or tissue changes. The hysterical contract attended by freedom of the wrist, with bending o first phalanges upon the metacarpal bones. The o present but a slight degree of flexion. The appea of the hand is striking, the fingers being uniformly and crowded together so that a sort of cone is fo the apex of which corresponds to the extremity of th

phalanx. The thumb is adducted and strongly forced against the index finger, and the whole hand is flexed quite strongly. Sometimes there is a greater degree of flexion so that the phalanges and metacarpal bones are strongly flexed, the fist being doubled as in the illustration (Fig. 4). The articulations and ligaments are not affected; and not only can the deformity be easily reduced when the patient is placed under an anesthetic, but it becomes less during sleep. Both extensors and flexors are involved, and in this respect are the criteria of spasmodic contraction. The contracted extremities of these patients are cold, the skin is livid, there is no real atrophy,

FIG. 5.—Hysterical Contracture of Foot. (Richet-Preston.)

no true *main-en-griffe*, such as belongs to injury or disease of the ulnar nerve or progressive muscular atrophy. *Like the paralysis, such contractures are as a rule associated with the sensory symptoms of hysteria.*

When the leg and foot are contractured, we find condition of extreme extension extending from the thi down. The appearance of the foot is quite different fr that belonging to any other form of paralysis or contra ure, and the deformity is that of equino-varus, the t being sometimes extended or again are rigidly flexed (F 5). In some cases the distortion in a way suggests th which follows advanced poliomyelitis, but of course the is none of the atrophy of the latter.

CASE V.—Janet, among a number of cases of hysterical co tractures due to fixed ideas, reports that of a woman, aged 31, w presented a permanent emotional state, hemianesthesia, amy sthenia followed by hemiplegia and left-sided varus. The patie between the ages of seven and nine sustained an injury of the l foot, which consisted of a sprained ankle due to a fall fr a swing; and bandaging and retention for some time in an ir instrument were sufficient to develop a spasm and condition varus. This disappeared, but reappeared with hysterical he plegia *after an interval of many years*.

In this connection attention may be called to the fa that in hysterical subjects the injudicious use of retenti apparatus or unnecessary braces may not only perpetua contracture, which would get well if let alone, but w actually induce such conditions where some simple blo has been received. With both hemiplegia and parapleg there are apt to be contractures of a spasmodic natur which must not be confounded with that before men tioned under the head of paralysis. The appearance o the extremities is that just described, and there may be associated with it an obstinate contraction of the muscles of one side of the trunk (Plate I.). When the trapezius, and those muscles at the back of the neck are in spasm, there will be added a forcible retraction of the head.

Contraction of Trunk, the Result of a Fixed Idea. (Modified from Raymond-Janet.)

An inspection of a large number of the French cases shows that permanency of contracture is the exception, and that contractures of all kinds, especially those which are limited to one or more extremities, are apt to take place as a phase of a general hysterical state in which amyosthenia largely figures. According to Axenfeld and Huchard, Raymond, Richet, Janet, and others, the common types of hysterical contracture occur in the following order of importance:

I. Monoplegic form, the leg being more often involved than the arm.

II. The paraplegic, both legs being paralyzed and contractured together or consecutively.

III. The hemiplegic form, the left side being the most frequent site. Rarer varieties include an affection of the four extremities; the crossed type, one leg and arm being affected on opposite sides of the body; and in addition to these come the localized affections, such as torticollis and the like, which, however, rarely follow injury.

Certain hysteroid conditions, in which there are tonic muscular spasms attendant upon voluntary effort, belong to what has been called the Thomsen symptom complex, and may follow fright or mental stress. These conditions are of interest because of their chronicity, and for the reason that they have an undoubted psychical origin. The writer has described a case of this kind which at the time reported was compared to Parkinson's disease without the tremor, so closely were the other symptoms copied. There were the station and gait of the latter disease, something of the speech disturbance, and a striking rigidity which was permanent, but followed the attempt to walk, and many other voluntary movements. This myotonic

condition hardly comes under the term *myotonia acquisita*, which it resembles very much, for it is evidently a grave psychopathic state marked by a persistent volition-loss. Chronic spasms and tremor are common in all kinds of hysteria, and the various tics, choreiform movements, tremors and shiverings may be local or more or less irregular, in this respect resembling the paralyses and contractures.

A paralyzed or contracted extremity may be the seat of *spasm*, in some respects like a hemichorea of organic origin, but its real nature may often be determined by the trial of suggestion. Whole groups of muscles are perhaps involved in tremor, or separate muscular bundles may as a result of trauma become the seat of twitchings or lively spasms, and even the involuntary muscles may be agitated. Two forms of spasmodic affection have been found in connection with traumatic hysteria, which may be particularized as *myokamia* (Schultze) and *paramyoclonus multiplex* (Friedreich). The former consists of muscular quivering of isolated muscles, and, according to Walton, does not involve the entire muscle at any time, but group after group of fibres. It resembles the fibrillary twitching of progressive muscular atrophy, and it is conceivable how a false diagnosis may be made in early cases of the latter. The muscles of the calf, thigh, and the glutei, and sometimes those of the shoulder are involved, and there is an increase of electric irritability for a time. While such tremor may occur as a result of tobacco, alcohol, or other toxic agents (Walton), trauma is known to be a frequent cause. Several interesting traumatic cases have been reported, among them one by King, who found it after a blow on the

groin. The writer has seen one case in which it chiefly affected one quadratus as well as the posterior muscles of both legs in an old alcoholic who had had a rather heavy fall upon his buttocks, and was greatly benefited by static electricity and other suggestion treatment. The condition is by no means a serious one, but is evidently a purely peripheral disorder. What is known as *paramyoclonus multiplex* consists of suddenly developed and severe clonic spasms, chiefly of the larger muscles of the body, those of the leg and feet being affected in a lesser degree; it usually follows violent emotion. "The patient without warning is seized with sudden and lightning-like contractions of the trunk and hip muscles, which cause his body to be alternately flexed and extended, so violently that he is often thrown from the chair or couch on which he is lying" (Dana). This is followed by tremor when the particular attack ceases. There are cases due to trauma in which *myoclonus* has lasted for several years, and such a one is reported by Prince.

CASE VI.—In this patient "the spasms were confined to the legs and developed as a traumatic neurosis following a carriage drive, during which the carriage was overturned after being struck by a trolley car. That same night there developed marked spasms of the legs, confined almost entirely to the quadratus femoris, but also extending over the back of the legs when an attempt was made to move. The spasms persisted for forty years." Prince tried nerve stretching by bending the legs backward and upward as far as possible toward the shoulder. Immediately following this there was a change in the spasms, which continued during the night, but the next morning finally disappeared.

Other cases have been benefited or cured by mental therapeutics. *Tremor*, either fine or coarse, is found in hysterical subjects, and differs from that of traumatic neu-

rasthenia, in which there is present a general and constar tremulousness. In hysteria the agitation mimics that some of the more serious diseases of the nervous systen which differ greatly so far as the presentation of this symp tom is concerned, and in many litigated cases it may ofte be claimed that multiple sclerosis exists. It has not th true character of the tremor of the latter, although it re sembles it closely, and is hardly an "intention tremor, though varying in intensity under emotional influence The distinction has been made that in both affection the tremor is cumulative, but that as soon as the objec is seized or the effort is accomplished, the tremor stop if it be due to multiple sclerosis; but if it is hysterica the disorderly agitation continues. In a measure this i true.

There is a form of paralysis agitans of hysterical origi which may closely counterfeit the central affection. I this, as in so many other mimicries, we find hysteric stigmata which make the diagnosis comparatively eas Janet reports two cases developing under the same co ditions, in both of which there were dreams, obsession and subjective sensations; and under some circumstanc both could easily be mistaken for the real malady.

Hysterical tremor somewhat resembles those tremo due to the toxemia from metallic poisoning, especially lea and mercury; there is a confusing anesthesia in the latte however, which is not so irregular and peculiar in its sit ation as in the former, when it may be found in distin and characteristic areas. In the latter, too, the reflex are lowered or abolished, and there may be wrist-drop other forms of paralysis, and finally some atrophy. both hysteria and neurasthenia there is general bodily u

steadiness, that may be recorded by Dana's ataxiagraph, which is placed above the patient's head and registers movements attending the swaying of the body. It is a question whether the general inco-ordination found in some of these cases is not due rather to indecision, clumsiness, and timidity than to anything else, so that the ataxiagrams obtained do not always possess diagnostic value.

The Reflexes.—Should there be anesthesia which is at all marked, it will be found impossible to evoke some of the superficial reflexes if the stimulus be applied on insensitive skin. The deeper reflexes may be absent in hysterical hemiplegia, or unaltered, thus enabling us to differentiate it from that due to a central lesion with a subsequent degeneration of the spinal cord, where there is an exaggerated knee-jerk. They are, however, present and sometimes increased in hysterical paraplegia of traumatic origin. Ankle clonus is very rare. Bailey refers to one case, but the writer has not seen it except when some coincident central disease existed.

Sensory Symptoms.—Peculiar disturbances of sensation are eminently characteristic of hysteria in general; and in the traumatic variety these are usually abundant and luckily so well marked as to enable us to differentiate a functional affection from one of central origin. This is not always a thing, however, that can be easily accomplished, and numerous attempts have been made to draw some sort of close line between the hysteroid loss of sensibility and that dependent upon an organic disease. Such anesthesia may be associated with hysterical attacks, amyosthenia, actual paralysis, or contractures, remaining or disappearing with or after the motor symptoms. The peculiarity of these forms of sensory disturb-

ance is that they are very irregular in their appearance, do not correspond to regions supplied by particular nerves, and have a disposition to appear suddenly in spots or to affect certain areas, the limitations being sharp and well defined. In traumatic hysteria we find *anesthesia* of three kinds: that of touch, or *tactile anesthesia;* insensibility to painful impressions, or *analgesia;* insensibility to heat and cold, *thermo-anesthesia*, as well as occasionally the impairment or *loss of the stereogenesic function* which prevents the patient from distinguishing form in association with weight. Increased susceptibility to tactile impressions is known as *hyperesthesia*, and to actual pain impressions as *hyperalgesia*.

In addition to these there are the *dysesthesia* and *paresthesia*, to which allusion has been made in speaking of neurasthenia.

Analgesia is by all odds the most important kind of sensory disturbance; and while all three forms of anesthesia may at times be lost, it is unusual to find them conjointly affected. This insensitiveness to painful impressions may be said to be the kind of anesthesia that gives the disorder its occasional dramatic interest, and has played a part in many an historical episode of a religious nature, developing often as the result of a fixed idea, or in consequence of some intense emotional exaltation. We find instances in the history of every faith where martyrs have gone to the stake in a condition of auto-suggested insensibility, or have uncomplainingly submitted to the cruelest tortures.

The performances of the fanatical Assöuai, when live coals are held in the unprotected hands, or snake bites and ordinary painful injuries are borne without discom-

irregularly distributed spots or zones in which the anesthesia is more or less complete. *Second*, the gauntlet-like or glove variety, where a hand or foot or perhaps a whole extremity may be anesthetic, there being a sharp limitation between the sensitive and insensitive regions. *Third*, what is known as hemianesthesia, where one-half of the body is involved, the insensitiveness stopping sharply at the median line.

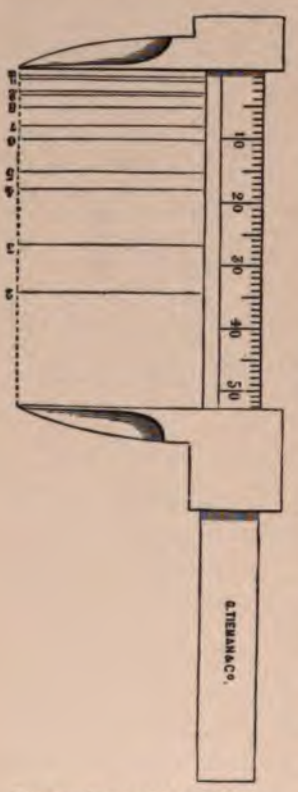


FIG. 7.—Sieveking's Esthesiometer.

Under the first head may be grouped the affections which lead to the alteration of function in the organs of special sense. Spots of anesthesia of variable extent may also involve the buccal mucous membrane, or that of the anus or vagina. These spots are very much modified by certain kinds of contact; and the fact that they are not dependent upon any local or even deep disease, but are rather a psychical phenomenon, is proved by the experiments of Burcq and Charcot, who showed that it was possible to clear up anesthetic spots or transfer the area of insensitiveness to some other part of the body by the mere application of coins or magnets to the surface. Perkins' tractors, which were used nearly a hundred years ago by the quacks of the time for the purpose of "drawing out pain," probably acted in the same way. Analgesia sometimes extends to

for the same purpose a camel's-hair brush enables one to make a rougher test. A needle, or an electrode with a sharp point, which is connected with an induced electric apparatus, will show the analgesia, should it exist, and two test tubes, one of which is filled with warm and the other with cold water, are all that are needed to determine the condition of the thermic sense. In hysteria there often exists a dry and insensitive condition of the skin quite unlike the moist cutaneous surface of the neurasthenic, which not only interferes with the passage of electricity, but may minimize the value of tests with a needle, or the other ways suggested.

FIG. 8.—Meyrowitz's Recording Perimeter.

The organs of special sense are involved in the same anesthesia, and suffer more or less extensive losses of function. Chief among these is the limitation of the field

Lower part of occiput	12 lines
Back of hand	14 "
Neck under lower jaw	15 "
Vertex	15 "
Skin over the patella	16 "
Skin over the sacrum	18 "
Skin over the sternum	20 "
Skin over cervical vertebræ	24 "
Skin over middle of back	30 "
Skin over middle of the arm	30 "
Skin over middle of the leg	30 "

tion, "though the absolute area of the field is the same no matter at what distance it is measured, the patient sees the world as if looking through a tube of infinite length."

The loss of the color sense, which may be tested by the perimeter, is one of the most interesting of hysterical anesthetic phenomena, and has not always the same method of progression. Sometimes all the primary colors gradually disappear until the perception of red alone re-

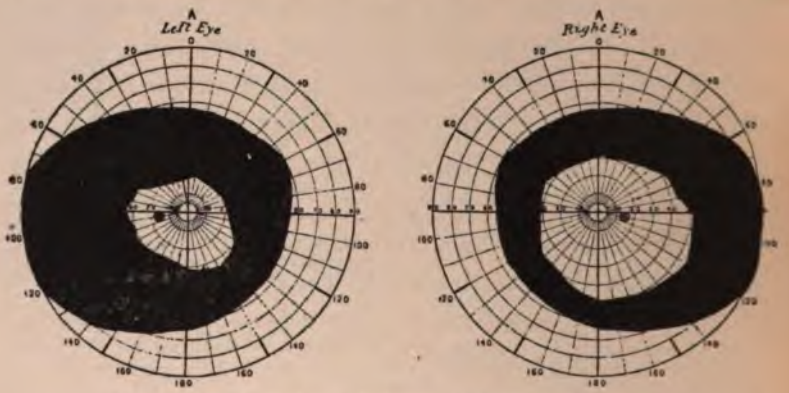


FIG. 9.—Crossed (functional) Amblyopia. (Purves-Stewart.)

mains; again the last color to remain is blue. When none can be distinguished, the patients see "everything gray." The loss is commonly concentric, and it is possible with proper apparatus clearly to mark the different lines of limitation and the distance at which the colors are lost. The worsted is also available.

Monocular troubles are significant and unilateral, and hemianopsia or diplopia which have no serious central explanation are among these. In certain subjects there is a peculiar *loss of power of binocular convergence* without any single ocular muscle being paralyzed. A woman who had

been injured in a collision recently, and who was seen by the writer, could not converge or focus her eyes on any object inside of twenty-four inches. Some hysterical persons see objects held in front of them much smaller than they really are (*micropsy*), or larger (*megalopsy*). *Monocular polyopsia* consists in the perception of two objects, one usually above the other. This may be found when one eye is covered, and the subject is asked to look with the other at a pencil or some other object. Vague ocular pains which radiate are highly suggestive of hysteria, and are anything but constant.

Hysterical deafness is one-sided or symmetrical, and of course is found without any change in the bone or

FIG. 10.—Galton's Whistle.

auditory apparatus, unless it be the subjective one of anesthesia. It may be tested with the tuning fork or by the aerial method. While the former, if held between the teeth or applied to the bones of the head, will not be heard in the deaf ear, the subject will readily perceive the watch tick at a normal point.

Galton has discovered that certain subjects cannot hear very high notes, but can those of the medium register, and has invented a whistle to demonstrate this. With this the normal individual should hear a note produced by ten thousand vibrations per second, which corresponds to 8 mm. on the scale of the instrument. Persons with an-

esthetic defects of hearing do not appreciate high notes. Hysterical deafness or diminution is more common than abolition of smell or taste, and Preston finds it usually associated with actual anesthesia of the external auditory meatus and the tympanum; in fact, the lowered sensibility of all the organs of special sense bears a general relation to the presence of cutaneous anesthesia elsewhere.

Loss of taste (*ageusia*) and loss of smell (*anosmia*) are, if found, commonly unilateral, and in almost every case in connection with hemianesthesia; and these may be tested with appropriate apparatus. The former is limited to the back or front part of the tongue, and is accompanied by local anesthesia of parts in the vicinity.[1]

[1] Zwaardemaker ("Les Sensations Olefactives," L'Année Psychologique, 1899, p. 202) has invented olefactometers for testing not only the intensity of smell, but the subject's selective and differentiating power. These are constructed with the idea of gradually exposing an increasing surface which has been coated with a perfume. A cut of the simpler instrument is appended. In those of more elaborate construction there are two tubes instead of one, and porous cells surrounded by a reservoir of glycerin, with which the particular odor has been incorporated. The acuteness is determined by "olefacts." Zwaardemaker has a classification of odors:

I. *Etheric odors* (Rimmel's fruit series).

II. *Aromatic odors* (terpenes, camphor, spices, herbs, roses, almonds, chemical subdivisions of cineol, eugenol, anethol, geraniol, benzaldehyde).

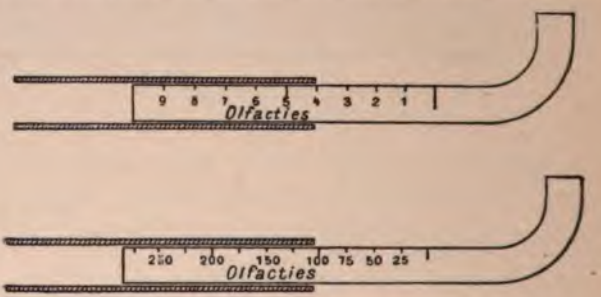


FIG. 11.—Zwaardemaker's Olefactometer.

Care should be taken to differentiate this kind of altered function from the loss which is due to central disease; notably to tumors or lesion about the uncinate gyrus in which is located as well the sense of smell.

CASE VII.—A case recently tried in which the writer testified was that of a woman who had been thrown down by a car and who was rendered unconscious. She was taken to the Roosevelt Hospital when her immediate symptoms of shock disappeared, but she developed erysipelas of the head and arm, with high temperature and delirium, and it was a month before she was discharged, when she was taken to a friend's house and then to another hospital. It was claimed that she had a hemiplegia of the left side, due to cerebral hemorrhage and complete loss of taste, but not of smell. There was no fracture of the skull, and the hemiplegia was clearly hysterical, disappearing suddenly and reappearing on the other side. At one time it was claimed she had a crossed paralysis with contracture,—the left leg and right arm being affected. There were spots of dysesthesia, and a great spinal hyperesthesia.

Ageusia and anosmia may of course be due to various other causes; among them true central disease, nicotinism, plumbism, alcoholism, or are a result of cocainism and other toxemias with local effects, or they follow tumor. Sometimes the latter is the ordinary consequence of a local affection of the mucous membrane. In these instances it is double.

III. *Balsamic fragrant odors*, jasmine, violet (terpinol, ionon, vanillin).
IV. *Ambrosiac odors* (amber, musk).
V. *Alliaceous odors which embrace the cacodylics*, vulcanized rubber, a mixture of gum ammoniac and india-rubber, asafetida, ichthyol.
VI. *Tarry odors.*
VII. *Valerian.*
VIII. *Narcotics.*
IX. *Stinks.*

The recently invented coal-tar synthetic perfumes should be covered by classes II. and III., but they really are not. In this connection the writer has recently seen a case in which a peculiar perversion of smell for all these existed, which did not extend to their natural analogues.

Conditions of *hyperesthesia* are of far less importance than those of anesthesia. The areas are rarely as extensive; in fact spots of superficial increased sensibility are characteristic of this kind of sensory disorder. These areas may be in close juxtaposition with the anesthetic regions, with absolute anesthesia perhaps of a leg and foot and hemihyperesthesia of the rest of the same side of the body; but this widespread hyperesthesia is unusual. It is not uncommon to find this distribution in association with hyperzones and dysesthetic areas elsewhere. What has before been said as to the sensitiveness of the vertebral spines may be again referred to, for it is present both in neurasthenia and hysteria. It may be added that when firm pressure is made on one of these, or some other painful point, there will be a decided acceleration of pulse rapidity (Mannkopf's symptom). From the fact that when hyperesthetic spots are pressed or irritated, other symptoms of hysteria may be induced; these have been called *hysterogenic zones*. Sometimes an hysterical paroxysm may be stopped by cauterization or firm pressure over the ovary, or by compression of the testicle. The writer has elsewhere reported such a case seen with Robert Abbe.[1]

CASE VIII.—The man who was a morphine taker was the subject of an attack of grand hysteria attended by rather general anesthesia (analgesia), unconsciousness, nystagmus, contraction of the trapezius so that the head was retracted, violent clonic spasms of the thoracic muscles, exaggeration of the reflexes, and a condition of mental excitement somewhat akin to those reported by the French writers. Forcible compression of the testicles effected a prompt subsidence of all the symptoms after they had lasted twenty-four hours, and there was no return.

[1] Brain, June, 1886, p. 528.

The terms "ovarian," "supra- and inframammary," and "spinal" and "testicular" are used to localize these zones.

An interesting form of hyperæsthsia is that which counterfeits joint disease, and which often leads to errors of diagnosis. The determination of hysterical joint affections is possible by the recognition of the fact that the psychic element is always present, and that pressure of some remote point will cause as much, if not more, alleged suffering than when the actual joint itself is disturbed. This *hysterical arthralgia* is ordinarily unattended by any degree of swelling, and there is no redness. A significant peculiarity is that rough handling does not produce as much distress as when the surface is lightly touched, especially when the patient watches the manipulations. The knee- and hip-joints are commonly affected, especially the former.

To *dysesthesia* rarely belong the well-defined distributions of disturbed function that are found in anesthesia and hyperesthesia. It is vague and sometimes is seemingly connected with true organic changes, and has then an apparently reasonable explanation. Other dysesthesiæ are associated with contractures, and a third kind is found in anesthetic subjects when the analgesia is not complete. It is observed that when anesthesia is advanced and complete, the patient makes few if any complaints; but if the sensibility is simply enfeebled, he is annoyed by pricklings and other disagreeable sensations. Dysesthesia under certain circumstances may, as the result of a fixed idea, assume a new character leading to the development of hysterical hallucinations.[1] A sim-

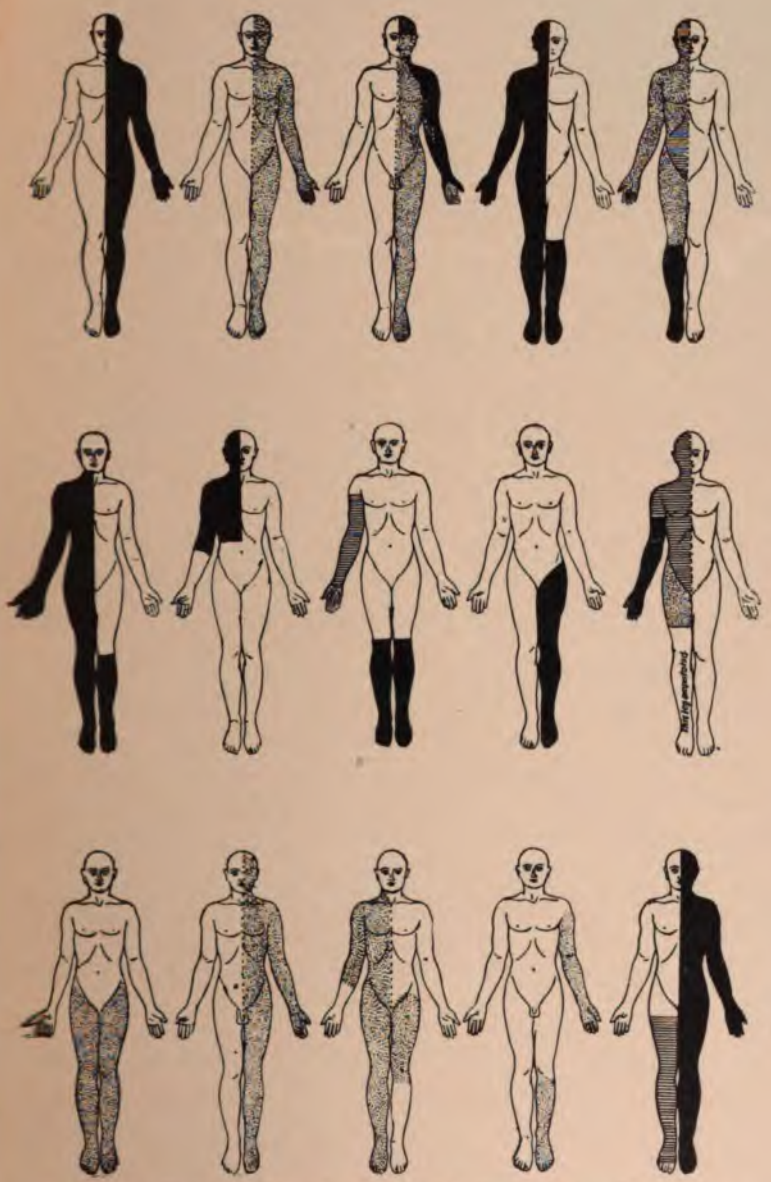
[1] Probably this is the explanation of certain sensorial delusions in paranoia.

ple pain in the thorax may lead the normal individual to believe in phthisis; but in such a case as that presented by Janet, there was not only the obsession growing out of a pain in the chest, but hysterical contractures of the intercostal muscles of the left side of the chest and other stigmata existed. Fixed ideas of local pain after laparatomy must be familiar to every surgeon, and in this connection attention is called to the dysesthetic conditions in litigants, who refer much of their vague pain to harmless scars and depressions, especially of the scalp. Persistent ideas of cold and heat are found among hysterical subjects, and their unilateral character conveys their true nature.

Janet also speaks of a man who presented cold areas on the left foot, outside of leg and thigh, and on the shoulder of the same side. These spots were slightly hypoesthetic and did not extend. They were associated with hypochondria, and the condition had lasted for sixteen or eighteen years.

CASE IX.—A personal case occurs, the patient being an hysterical woman who had been in a railroad wreck and although not injured herself, saw others burned by steam. She developed almost immediately after the accident a fixed idea that she had been scalded by escaping steam, and for many years would call attention to the tingling and smarting of certain spots which were larger than those in Janet's patients. Of course she had never been injured at all. There was no tactile loss. Her visual fields were contracted, and her left hand and arm anesthetic. Subsequently neurasthenic symptoms appeared.

In certain forms of hysteria the senses of smell, taste, and hearing may become intensely hyperesthetic, certain odors producing great discomfort and the patient being able to hear high notes of Galton's whistle, which are inaudible to others.



Various Types of Functional Anesthesia. (Purves Stewart.)

and in fifteen minutes afterward, during which time she was questioned rather rapidly, it increased to 102. At the second visit I was still more convinced of her interest in what was going on about her, although she would not at first speak. When sharply cross-examined, she opened her eyes and replied to my questions, getting out of bed and making every attempt that I suggested, and showed that she was the possessor of fair amount of muscular power. Although she finally declared she could not see, and firmly shut her eyes, I found a pair of eyeglasses by her side which she admitted she had used. After her irritation she became loquacious, although keeping up her silly manner at times, and resorting to the baby talk. She spoke freely at others, calling attention to the vague pains in her head, forehead, and back. I found the latter to be hyperesthetic. She claimed that she could not walk and that the *left* leg and hand were without power; but there was something very suspicious about this alleged loss, for she made an evident voluntary effort to keep the fingers flexed when I held the hand, and subsequently allowed them to relax; but when she got back to bed after sitting in a chair, she not only grasped the back of her daughter very forcibly, using the left hand as a well person would, but the left leg as well, without embarrassment. The jury in this case gave a verdict of between two and three thousand dollars—after her appearance on the witness stand. Although a well-known neurologist had testified that she was demented, she had no difficulty in answering the majority of questions intelligently in a low voice, occasionally mispronouncing a word when she became annoyed or confused, evidently by the purport of the question. There was nothing in her appearance in the court room that indicated the alleged paralysis, and she certainly was not aphasic.

The writer has seen cases of word blindness and word deafness, but the hysteroid character was revealed by repeated examinations which showed their inconsistency. All psychomotor acts of the hysteric are noted for their inconstancy.

Troubles of respiration are more marked in *hysteria major*, and are rarely seen in the traumatic form. In a

small proportion of cases, especially when there is a neurasthenic admixture of symptoms, there is a decided acceleration of respiratory efforts, the normal rate being often increased three times. Osler reports a case in which the respirations were 130 per minute, and the subject himself had counted 150 at another time. The patient is habitually apt to count, as was the case with this individual, and doubtless the rate of respiration is increased by the expectant attitude that is cultivated. In the excited conditions a myographium tracing will show a great disproportion between the action of the abdominal and thoracic muscles, especially in *splanchnic hysteria*. The rarer symptoms of this variety may be found in traumatic examples. While I have never seen that form of abdominal distention known as meteorism or some of the other phenomena of a disturbance of the sympathetic or splanchnic nerves, it is not unusual to find persistent vomiting, neurotic edema, and *hematemesis hysterica*. In one case the writer found that the disorderly collection of symptoms was augmented by that of chromidrosis; but in all except this there had been attacks of hysteria major. Allusion has already been made, in speaking of neurasthenia, to the case of Mr. R——, and the vomiting of blood was undoubtedly here a hysteroid complication. Bernhardt and Kronthal report the case of a man who had lived three years after an accident, and besides his hystero-neurasthenic symptoms he occasionally had attacks of hematemesis, but no internal lesion was found at the necropsy to account for it. What is known as *neurotic edema* is a rare symptom in traumatic hysteria.

Case XI.—A case of hystero-neurasthenia which fell under the notice of the writer was that of a laboring man who fell from

a street car of the Third Avenue line, in the month of December, 1895, striking the back of his head and left hip. He was dazed and nervous, and was taken to Bellevue Hospital, where a slight bruise was found at the back of his head, but no other external evidence of trauma. After a stay there of less than an hour he went home, and remained in bed about a week, and in his house about a month and a half. He engaged a lawyer the next day to bring suit against the railroad company and was seen between this time and March, 1898, by not less than four physicians. His complaints were that his left arm and hand were first swollen, that the left leg was dead and cold, and that he could not bend the arm, "and had no ambition to raise it." His voice was weak and had been so ever since the accident, and he "saw stars" when reading. There has been persistent insomnia and "he awoke nearly every hour." He has not been able to walk ten blocks since the accident, although about this there has been a conflict of opinion. He could not cohabit with his wife, though he has the desire. His several physicians testified that they were able to thrust pins into both legs and "into the substance of the prostate gland" without any pain being produced. From the time of the alleged injury until March, 1898, he said that he had lost thirty-four pounds, and there had been a state of continued invalidism up to that time, with constant vomiting, so that he could not retain any food—not even milk; in spite of this, however, he looked fairly nourished. His appearance was characteristic, his forehead being wrinkled, and his expression was one of resigned grief. According to his physicians he was unable to use the muscles of the left side and there was diminished reaction to the faradic current, and according to them his skin was insensitive to strong currents applied to the surface of the left foot, leg, and thigh; the entire back being sensitive. A physician of the company who made an examination was unable to find any indication of organic disease, flatly contradicting the physicians of the plaintiff. There was certainly no embarrassment of motion when he took the witness stand, for at different times he apparently used his lower extremities without difficulty and it is probable that he had recovered from any previous motor weakness. When he raised his trousers it was found that there was an uneven, pronounced edema of both extremities with shiny skin, and this existed without any renal disease or history of alcoholism, so that,

taken with the vomiting (about which the testimony was most emphatic), there was probably some splanchnic hysteria. He obtained a heavy verdict, and I was informed by his counsel two years after the trial that his condition had improved but little.

Hysterical suppression of urine has been described fully by Charcot. This irregularity, which in a minor degree existed in the case of the hystero-neurasthenic Mr. R—— when the urine on one occasion was passed only once in thirty-six hours, may be a much more pronounced symptom. This *ischuria* may consist of periods of suppression, which in Charcot's cases apparently lasted for weeks, and is often followed by *polyuria*, when the patient passes large quantities of limpid fluid. In these cases there is often vomiting or profuse sweating or salivation, and the urea is thus probably gotten rid of in other ways.

The Mental Condition.

The mental state of the hysteric is notably one of disequilibrium, implying the most disorderly kind of concept association, a riot of sentient impressions, and more or less absolute weakness of will, which is shown in the abasement in the exercise of all the intellectual functions. In the hysteria major of the French we are furnished with a *bouleversement* of an extravagant character shown by varying disturbances of consciousness, a state of ecstasy, "beatitude," and alternations of emotion. Conditions of double personality are referred to by Richet, Janet, Myers, and others, and occupy a prominent place in neurological literature, and the religious exaltation and the connection with hysteria are doubtless due to racial and local peculiarities. Its hallucinations are rare outside of France, and this religio-sexual tinge is due in a measure to

the environment of the patient. In America and England these cases are rare. The mental condition is rather that of the so-called "interparoxysmal state," the ordinary feature of which consists in a peculiar emotional and moral instability which is seen in perverted ethics and morals, lying being easy and habitual. There are the constant demand for sympathy, the love of notoriety, and the martyr-like bearing which may be quiet or obtrusive, with vacillation, and weakness of judgment. Tears or laughter are so near the surface that without adequate cause the subjects are as likely to weep as to laugh for the same reason. They sometimes make charges against others so shallow that they should see the certainty of exposure and detection which they do not. Sometimes, as Lefèvre has shown, the charges of assault are made by irresponsible young girls as the result of unconscious auto-suggestion. Memory is apt to be deficient, or may be lost in hysterical subjects about certain occurrences; but there is no rule about this, and there is often simulation for obvious reasons. The hysteric may, and often does, lapse into a state evidenced by mental symptoms of an irregular kind. These departures are appreciated in a measure by the subject, but he cannot escape them, and they take the form of obsessions, which are perhaps fleeting and short-lived, phantasms and hallucinations of memory.

CASE XII.—L. G——, a woman of thirty-one years, was one of the occupants of an elevator which fell a short distance in a department store. No one was injured but herself, and she was only shocked and demoralized; she claimed she was for a few moments unconscious. She was taken to her home in the upper part of the city, and the next day had an apparent hysterical convulsion with unconsciousness, and after recovery passed a large quantity of urine involuntarily; she subsequently be-

came aphonic, but this disappeared as suddenly as it came. There were subsequently backache, cephalalgia, and various dysesthesiæ. When seen for the second time, October 13th, 1901, she was apparently in a condition of profound ill-health, and was unnerved and aboulic. She complained of shortness of breath and general weakness, and ascended the stairs with great difficulty. She was pallid, had a weak pulse, and had a melancholic facies. There were areas of hyperesthesia on the right side of the body, and especially on the scalp, which was so tender that the weight of her hat caused her great pain. She could not read without great fatigue, and if she persisted had an hallucination of seeing smoke. At times she was nauseated and had hysterical vomiting. From time to time she had hysterical contractures of the left side of the body, with anæsthetic spots. At the time of the accident she was menstruating, but it stopped and has never but once reappeared. About three months after the accident she developed morbid fancies, some of which became obsessions, and she had an impulse to spring at and injure her husband, to whom she was devoted. When holding her child upon one occasion she had a loss of consciousness following an obsession and impulse to kill it. At other times she had visual hallucinations when she saw the figure of a man in black who laughed at her; she, however, recognized that it was merely a phantasm, but was nevertheless frightened. At the time of the last visit she slept badly and was tortured by dreams. Her case was settled with the insurance company, but I was informed a year later that her condition had not improved to any great extent.

MAJOR OR GRAND HYSTERIA, to which reference has been made, is occasionally met with in connection with trauma, but in such cases there have undoubtedly been previous convulsions and manifestations due to other agencies. When a consequence of the accident, it is purely the result of fright or developed brooding. The *accès* are occasional and general, and the patient is apparently unconscious, although not always so, for she may subsequently recount what has taken place. Sometimes the attack may take a cataleptoid phase and last for a

long time. Even with those who are supposed to be honest there is deception and lying, perhaps a pretended inability to take food, or to do certain things they are perfectly able to. To this class belong the examples of alleged continued unconsciousness which often find their way into the newspapers. Sometimes these states occur in males as well as females, and the following case, in which the writer appeared, may be quoted:

CASE XIII.[1]—W. S—— was a boy who, during the year 1896, was employed in a trunk store, and it is claimed that he was one day assaulted by two employees of the city because he refused to remove from the sidewalk certain trunks which should not be there. Almost immediately after the assault, which does not appear to have resulted in any great immediate injury, he became unconscious at his home in Brooklyn, and remained so until after the examination by the defendant's physicians on December 4th, 1897. He appeared to be nineteen or twenty years of age at this time. He was lying in bed on his back with head turned to the left, the left forearm bent at the elbow, while the arm itself was extended at a right angle with the trunk; the left leg was bent at the knee and abducted, the right arm was bent at the elbow with the forearm lying over the chest; the right leg was extended; the eyelids were closed and tremulous. There was considerable tremor of both legs. He was apparently unconscious, and insensible to all ordinary external impressions. The pulse was 140, soft and feeble, the respirations were 60 and very shallow; on raising the eyelids it was found that the eyeballs were strongly rotated so that both pupils were turned upward and to the left. So extreme was this rotation that the pupils could not be examined. The conjunctiva was apparently insensible. There were incomplete hemianesthesia on the left side and hyperesthesia on the right side, and tremor followed the irritation of the surface of the needle. The face was flushed and the general surface was moist and warm, with the exception of the extremities which were cool. There were no voluntary movements of any kind. The right side presented in a

[1] The history of this examination is largely drawn from the report of Dr. Austin Flint.

most marked degree the waxen flexibility and immobility when the arm or leg was put in a position requiring sustaining muscular contraction characteristic of catalepsy; but the upper eyelids fell immediately after having been raised so as to expose the globe. When the body was raised to a semi-erect position in bed this was maintained for several minutes, when there occurred violent general tremor, and he was restored to the recumbent posture to avoid possibly dangerous nervous disturbance. The same phenomena were presented when the right arm or leg was raised. The members on the right side were easily put in any desired position; on the left side there was rigidity amounting nearly to tonic spasm. The muscular contractions on the left side were overcome with some difficulty, and the arm and leg when moved soon regained nearly their original positions; the waxen flexibility, so marked on the right side, was but slight on the left. The plantar reflex was absent on the right side and delayed on the left. The knee-jerk was absent on both sides. During the examination he was given some milk from a feeding spoon or small dish. It required a few seconds to separate the teeth. A little milk introduced into the mouth in this way was swallowed after a few seconds, but the feeding as done at the examination was very slow, and it did not appear that it would be possible to introduce enough nourishment by this process to sustain life for any considerable length of time. The body, however, was apparently fairly well nourished, and there was no emaciation. Shortly after this, in 1898, his case against the city was tried, and he received a small verdict. In a few days he recovered consciousness and told his doctor that he had "been in a place too horrible to describe, where he had been constantly tormented by the employees of the Bureau of Incumbrances"; it was alleged by his physician that the hystero-cataleptoid state has returned, and that his condition has altered greatly for the worse. Yet it appears that the young man subsequently went abroad and returned sufficiently well to become a party to fresh legal proceedings.

Despite the fact that hysteria is one of the most dramatic and common nervous disorders, no attempt so far has conclusively fixed the existence of a central morbid state. In the form under consideration the post-mortem

findings have been equally unsatisfactory. Evidences of arteriosclerosis have been discovered by Bernhardt in two subjects on whom necropsies were made; but the question at once arises as to whether this vascular change was not due to something else which had no connection with the accident. It seems to be a favorite theory of those who

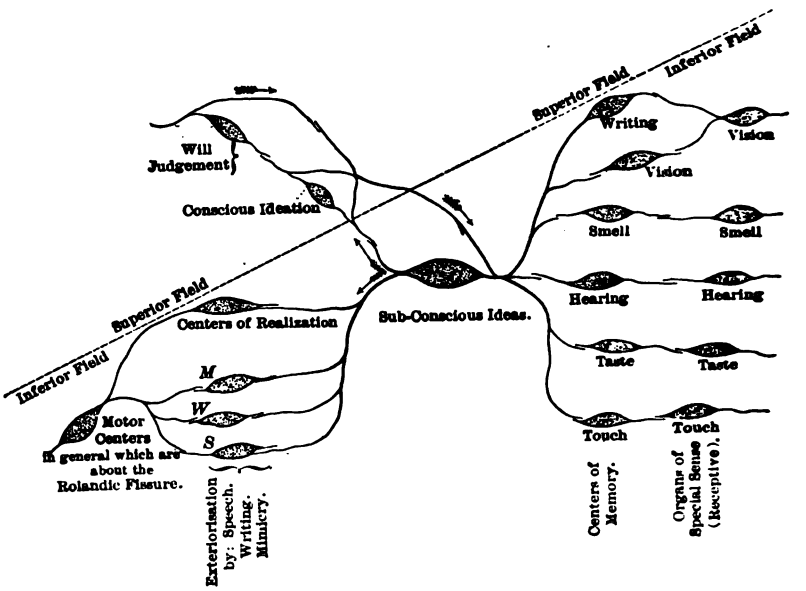


FIG. 12.—Scheme of Conscious and Sub-conscious Fields with Psychic Mechanism and Idea Formation. (Modified from Lefèvre.)

have written most extensively about traumatic neuroses that the morbid appearances are dependent upon multiple hemorrhages throughout the nervous substance. Artefacts are so commonly found that one is inclined to look upon their discovery with suspicion, especially as they are so often produced by careless manipulation, or are due to other causes, such as rough handling or extreme changes of temperature, the findings in the Guiteau case being an example of this.

The term hysteria should imply an inactivity of the higher centres and the enfeeblement of co-ordination and will power, while there, however, remains a certain amount of volitional activity of another kind which is part of the subconscious self. The conservation of this latter for the performance of certain actions that may have become to some degree habitual is possible, and be actuated by simple suggestion; or a disorderly expression of ideas that do not enter the higher sphere of consciousness sometimes takes place. Certain organs that become hysterically anesthetic, when the subconscious self is appealed to, are even able to functionate in a conventional way.

Sidis has in this connection called attention to the existence of the operations of the subliminal self, and has by suggestion been able to induce the subject of hemianesthesia and hemiplegia to do many things that were seemingly impossible when the already inhibited upper stream of consciousness was in vain relied upon, and when the superior will was dormant. "The law of suggestibility in general," says this writer, "and those of normal and abnormal suggestibility in particular indicate a coexistence of two streams of consciousness, of two selves within the frame of the individual: the one, the waking consciousness, the waking self; the other, the subwaking consciousness, the subwaking self. But although the conditions and laws of sensibility clearly point to a double self as constituting human individuality, still the proof, strong as it appears to me to be, is rather of an indirect nature. We must therefore look for facts that should directly and explicitly prove the same truth. We do not lack such facts. We turn first to those of hysteria."

The recognition of this process enables us to understand many of the extraordinary phenomena of hysteria, not only in its purely psychic manifestations, but in more material expressions which are ordinarily in antagonism with our preconceived ideas of responsible consciousness. It explains why an individual will deliberately and honestly make a declaration in regard to a subjective condition which does not really exist, for a perversion may be engendered as the result of a sufficiently strong shock or mental impression to inhibit the higher brain centres. The dependence of the motor and sensory symptoms of hysteria upon some disorder of the psychical equilibrium in contradistinction to the symptoms which follow structural disorganization of the elements of the cerebro-spinal system is characteristic of the disease. This is abundantly proved by several things. First, that all of the physical expressions, no matter how apparently real they may be, may not only be produced by suggestion, but are often the product of what are known, and what Berkeley refers to, as "dream ideas associated with the defective capacity for co-ordination of psychic processes."

Hysterical monoplegia, hemiplegia, paraplegia, contracture, or tremor may be thus accounted for, and the genesis of sensory disturbances, such as hemianesthesia in its various forms and limitations, is none the less difficult to understand. The fact that it is possible to restore or modify lost sensation by the application of magnets, coins, or other objects to the surface of the body where anesthesia has been found, or to transfer sensation (allochiria), must show that this lost function does not depend upon a lesion, or any destructive pathological process, but to an actual abeyance of function. Attention has

already been called to experiments that have been made which establish the fact that two streams of consciousness exist, but that it is possible to cause an individual in the hypnotic state not only to use an hysterically paralyzed limb, but to enlarge an hysterically limited field of vision, or to modify the individual's powers of perception by suggestion. The second and more readily understood proof of the unstable nature of the cerebro-spinal manifestations of hysteria consists in the fact that they may often be caused completely and suddenly to disappear under the influence of a profound mental impression. This possibility is as old as the history of medicine, and it has, it is unnecessary to say, entered into the creation of most of the marvellous and supernatural cures and miracles. Paget was the first writer who more than thirty years ago described these psychoses as imitative disease, or *neuromimeses* as he called them; and to-day skilful orthopedic surgeons and neurologists readily recognize the fact that the subjects of neurasthenia or hysteria may unconsciously present the symptom of real affections, especially those of the joints or the muscular system. These diseases may be so closely counterfeited, as the result either of slow and continued suggestion or of sudden shock, that the families of the patients and even skilful physicians will for a long time be deceived. In this connection we must recognize what modern psychologists have called the "disaggregation of subconsciousness" to explain the complete upsetting sometimes of the ordinary mental regulation, as well as the primary personal judgment—the preservation of the faculty of the estimation of the individual relation.

It is hardly necessary again to refer to the contributing

factors other than the trauma itself; and while Dejerine, Dorliat, and some writers agree that a hereditary soil is not necessary for the growth of the traumatic neurosis, the actual experience of those who investigate these cases most constantly would seem to contradict this. It is alleged that stout, healthy laboring men are as apt suddenly to become neurasthenic or hysterical after an accident as those about whose predisposition there can be no earthly doubt; but in these a diligent or even a superficial search may sometimes disclose a bad family history in which tuberculosis, alcoholism, or some such factor finds a place. It is a somewhat curious fact that since Jewish immigration has increased to such a degree during the past decade, many of the plaintiffs in accident cases are of this race; and it is well known that the predisposition of the Semite to insanity as well as nervous diseases of every kind is very great. Men seem to outnumber the women. Naturally children do not develop the so-called traumatic neurosis; but, when injured, suits are brought in their behalf for material injuries of more or less consequence. So far as the alleged source of injury is concerned, it would appear that falls backward are more common than others. It need hardly be said that the so-called traumatic neuroses not only follow general injury, when there is no recognizable wounding of the nervous organs themselves, but may develop when there is literally no physical trauma.

CHAPTER III.

INJURIES OF THE CRANIUM AND ITS CONTENTS.

EXTERNAL violence to the head is, of course, under certain circumstances, apt to be followed by widely varying disturbances of function, or by actual disease of the brain and its membranes. When subjected to direct and sufficient injury, the scalp ordinarily presents contusions, ecchymoses, and wounds of different kinds.[1]

While fractures and depressions may perhaps be found beneath such scalp wounds, the outer table being involved,

[1] 1. Blunt edges sometimes produce scalp wounds having straight outlines and sharp clean edges, which in these respects could not be distinguished from wounds produced by sharp cutting instruments.

2. Scalp wounds, which exhibit entire hair bulbs projecting from the surface of their sections, have been produced by a blunt instrument.

3. Wounds exhibiting nerve filaments or minute blood-vessels bridging the interspace between the lips of the wound, toward the middle of the depth of the section, while the tissues have receded all round them below as well as above, have been produced by blunt non-penetrating instruments.

4. When a wound, even with sharp, well-defined margins, bears in contour a resemblance to an osseous ridge in close proximity, there is a probability that it was produced by a blunt instrument through forcible impact against an underlying osseous ridge.

5. Cut hairs found in the immediate vicinity of a wound are valuable aids in determining whether a sharp or a blunt instrument has been made use of.

6. As to the diagnosis between wounds produced by instruments of the knife kind and other sharp-edged substances, such as glass, earthenware, etc., no dependence can be placed on the mere regularity of outline or sharpness of edge, or the reverse.

7. Sharp clearly defined wounds in certain cases present peculiarities in their terminations which may be sufficient to enable a probable diagnosis as to whether they were produced by a knife or a portion of glass or earthenware (Macewen).

injury to the cranial bones may be confined to the inner table, with possibly resulting symptoms of irritation and compression, and subsequent obscure but serious manifestations dependent on destruction or degeneration of the brain substance. The case again may not be seen until a much later time, when cicatrices and depressions, due to fracture or erosion of bone, alone remain; or, on the other hand, there may be more or less indication that the deep parts have been wounded or contused without any discoverable external appearance. Severe injuries often do little damage, while slight ones may, by transmission of force, lead to laceration of deeper parts and possibly abscess.

Surgeons generally hold that the amount of damage done to the brain is apt to be inversely proportionate to that inflicted upon the skull. It would appear that the head is more liable to injury than the spine, not only because of its position, but from the fact that the latter is so much more securely invested by protecting tissues. In some ways the skull is admirably adapted by nature for the care of its delicate contents; and, like other spherical bodies, often escapes the full force of a blow. It is for this reason that there are comparatively so few serious injuries as the result of so many seemingly dangerous exhibitions of force. Glancing blows, so common and frequent, are less likely to produce serious trauma; but, of course, the chance of injury from falls is greater. Much depends upon the age of the subject, the condition of his bones, and the possible existence of increased friability. Old people, as well as the insane, and those who are subjects of trophic disease, are especially liable to fracture when considerable force has been exerted. On

the other hand, even when there is no fracture, a skull may be subjected to a very great deal of violence and compression without any very dangerous results. In the young subject considerable bone displacement, with resulting pressure upon the brain, is possible, but the consequences are not necessarily serious.

CASE XIV.—In this connection Dennis reports the case of a child who fell to the basement from the third floor of a tenement-house, striking upon the head and sustaining an indented fracture upon the side of one parietal bone. The indentation was very marked, and the depressed bone caused cerebral compression to such an extent as to produce hemiplegia of the opposite side of the body. The child was taken to the operating room, and while in deep coma and still hemiplegic, the sides of the head were manipulated so as to cause a bulging out of the elastic bones of the skull, causing the indentation to disappear and consciousness to return at once, with instant relief of the hemiplegia, and subsequent complete recovery.

CONCUSSION.

Much confusion has arisen in connection with a consideration of what is known as *concussion*, which is the result of shock. It is produced in so many different ways, and the disturbance of the physiological condition is so variable, that there is often great want of exactness in defining its expressions and method of production. This disturbance of cerebral function is either very sudden and short-lived or lasts for some time. It is commonly due to falls or blows upon the head; but does not follow, as is often alleged, the sudden stoppage of a rapidly moving railroad train, being rather a direct and local exhibition of force. The protection afforded by the arrangement of the three investing membranes of the brain and the cere-

bro-spinal fluid is quite good enough to prevent any harm, or at least any lasting disturbance, even after considerable cranial injury; and as a rule simple concussion is likely to indicate a mere disequilibration. The term concussion then need not, *of necessity*, imply a serious or dangerous condition, its phenomena being usually transitory and consisting of symptoms due to the sudden depletion of the vessels of the head.

There are, however, fatal cases of concussion, death being preceded by a rise of temperature and an increased rate of pulse and respiration, which are ordinarily supposed to be due to impairment and final extinction of the functions of the vagus and other nerves regulating the respiratory centres. Kocher reports a case in which a patient died on the third day. He found no morbid appearance in the pons, medulla, cerebral peduncles, or cerebellum, but minute extravasation in the corpus callosum, walls of the left ventricle, anterior part of the left optic thalamus and frontal lobe, and in the anterior part of the right optic thalamus. He therefore believes that in fatal "concussion" there is really a widespread and minute laceration due to the distribution of an impulse by both brain substance and cerebro-spinal fluid.

Mental disturbances, extending from slight vertigo or confusion to complete loss of consciousness, which rarely lasts for more than a few days, more often a few minutes; perhaps vomiting; dilatation of the pupils, pallor, and cardiac weakness expressed by a small rapid pulse, are familiar to most persons. Under some circumstances there is a relaxation of the sphincters with involuntary discharges from the bowels or bladder. If the unconsciousness is protracted, it may be looked upon as the expres-

sion of some hysteroid state, or else of a far graver compression of the cerebral mass. Concussion is, after all, a sudden change of balance between the cerebro-spinal fluid in the ventricles, perivascular and other spaces, and the blood contained in the vessels themselves. To this is added a more or less general derangement of cell function. An important medico-legal fact is the relation of this state to consciousness and intelligence; and it has been held that without consciousness no concussion can occur. That is to say, if a person while descending a ladder has an attack of syncope and becomes unconscious, and then falls in consequence of his unconsciousness, he may not suffer from concussion of the brain at all. If he falls while conscious, he is certain to receive concussion of the brain, if he does not sustain a more serious injury.

Dennis, from the inspection of a large number of cases, has come to the conclusion that there is a decided difference as to the susceptibility to nervous accidents, especially concussion, between persons of high and low organization, a conclusion which has a bearing upon certain well-recognized facts familiar to criminologists. In this connection he reports the case of a dull, backward boy of sixteen, who could not read or write, and who fell six stories through an elevator shaft, sustaining a fracture of the skull without any apparent concussion, for he immediately arose and climbed up the five or six stories to the place from which he had fallen. He therefore regards persons of fine nervous organization and cultivation as those most unstable and susceptible to shock.

LACERATION AND CONTUSION.

These forms of injury are always of moment, and serious after-effects are likely to follow. They may or may not be associated, but are usually accompanied by a certain amount of concussion, and are productive of lesions of a destructive character, such as minute extravasation, edema, or rupture of some intracranial vessel with subsequent increased tension and tissue disorganization. The formation of a lesion in this way is often basal, even when the force is transmitted from above, as it may be. Under some circumstances the effects of a severe blow, inflicted upon one side of the head or on top, may be exerted upon an opposite point, provided the density of intervening tissues be favorable, and there be no interposing cushion of cerebro-spinal fluid, or by "cone bulging."[1] Such instances have been possible where there was no disturbance at the point of impact, and where a mistaken diagnosis has been made. In most cases, however, there often turns out to be a transmitted or radiating fracture from a superior point.

[1] Miles, of Edinburgh, made a number of experiments which consisted in the delivering of blows of varying force upon different parts of the exterior of the cranium. The result was a "cone of bulging" usually at some point opposite the point of impact, there being a determination of the cerebro-spinal fluid or a temporary change in the shape of the skull. In reality his results were an explanation of the older *contre coup*. Frontal and vertical blows caused the most serious results, the violence being expended at the base; and if sudden death did not occur with tetanic convulsions there were lesions of the ventricles, and the medulla and upper cord suffered. Occipital blows were less serious, while violence directed to the lateral aspect of the head was the cause of general disturbance, and the intraventricular pressure was decidedly modified, giving rise to a less serious train of symptoms suggestive of irritation. Some years ago Duret in the same manner experimentally produced a lesion of the fourth ventricle by striking the frontal bones forcibly, the explanation being that the cerebro-spinal fluid was driven violently back through the lateral ventricles into the fourth.

In laceration especially the occurrence of hemorrhage is usually immediate and sometimes extensive, leading to increase of intracranial tension, the meningeal arteries being most often ruptured. Laceration is a far more serious condition than contusion, and its effects are as a rule shown more quickly. *Contusion* of the brain is looked upon as a very common effect of trauma, even of a

FIG. 13.—Contusion of Brain. (Vibert.)

slight kind, and most writers emphasize its importance, some perhaps unduly. The most serious cases are those which are basal (Fig. 13). A certain number of observers consider what is known as *commotio cerebri* as but a form of contusion, although a distinction is made by those who would explain all persistent cases of traumatic neurasthenia in this way, especially those of the doubtful kind, in which there are suspicious expressions of central disease. When there is no fracture, but serious indica-

tions of a suspected cerebral contusion or laceration, an examination of the cerebro-spinal fluid, drawn by lumbar puncture, may clear up the real condition. In such a case, when a man had been hit upon the head, with resulting mental symptoms of a light grade with aphasia and it was believed that no fracture had occurred, the cerebro-spinal fluid, when drawn off and submitted to centrifugal action, showed the presence of a minute blood clot;[1] and further microscopical examination demonstrated that there were many red corpuscles. There can be no doubt that in obscure cranial or spinal fracture this procedure will prove of immense diagnostic value in the future. It is needless to say there is much exaggeration and misconception regarding cerebral commotion, and many purely functional examples are given undue importance.

CEREBRAL COMPRESSION

by blood, purulent formations, or depressed bone, or by the products of slow meningitis or hydrops, is manifested by evidences of increased blood pressure which continue until relief is afforded by an opening or until the case ends unfavorably. If extensive enough, the respiratory centres may be quickly overpowered and death occurs. In this connection attention may be called to the more or less authoritative statement that if one-twelfth of the intracranial space is encroached upon by a foreign body death will certainly ensue. Even when serious secondary symptoms develop and continue for some time, the relief of the pressure may, in exceptional instances, be followed by a rapid and complete cure; but much depends upon the nature of the morbid process.

[1] Verbal communication by Dr. C. L. Dana.

Cases of interest are reported in which bilateral pressure upon the upper third of the anterior and posterior central convolutions, wherein the motor centres for the lower extremities are located, produced a paraplegia which almost immediately disappeared when the gauze packing which had been introduced was removed. In one of these cases lowering of the radial-pulse pressure was recognized by the Oliver instrument, and noted from day to day as the impinging foreign body was withdrawn, the patient ultimately recovering.

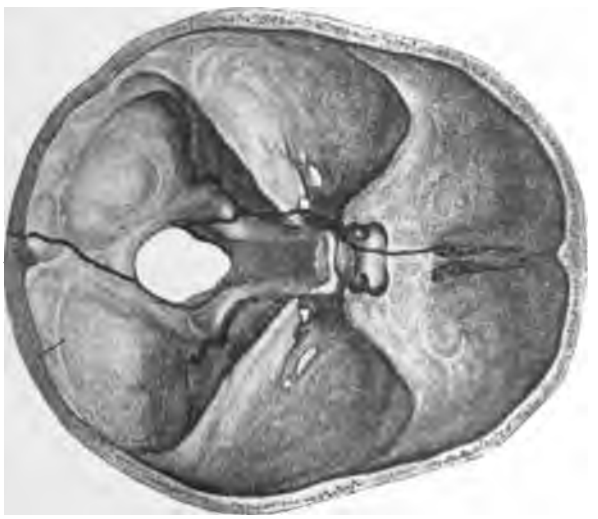
Cases of compression, as the result of head injury without external wounds, but with internal laceration, may present coma and convulsion, increased pulse pressure, Cheyne-Stokes respiration, dilated and slowly acting pupils, and apparent blindness. Sometimes there are to be found a number of lymphocytes in the cerebro-spinal fluid and other evidences of a commencing inflammatory condition; but it is even possible some days or weeks after an accident, with such increased intracranial tension, to effect an astonishing restoration by giving relief to the impinged brain in the manner indicated. In the event of such neglect the coma continues, vomiting occurs, paralysis supervenes with rectal and vesical incontinence, the temperature falls, and the signs of vital dissolution ensue. In this connection it may be remarked how tolerant the cerebral cortex may sometimes be to interference in the absence of serious compression. Several cases are recalled in which extensive comminution and depression of bone about or above the motor centres with laceration existed without any grave or lasting paralysis, or those sequelæ that might naturally be expected.

Case XV.—Dr. Lewis A. Stimson has communicated to the writer a case of this kind which in a way is somewhat unusual, but is an illustration of what has been said. The patient was a healthy man of fifty who, while engaged in the cellar of a building, received a head injury. A hammer-head fell from the tenth story, the prongs being driven through a Derby hat he wore and through the scalp and bone. He was unconscious for two or three minutes only, sustaining slight shock, and almost immediately talked rationally on his way to the New York Hospital. There was complete motor paralysis of the right arm and leg. The right knee-jerk was much exaggerated, as was the Babinski reflex on the same side; and there was a corresponding ankle clonus. The wound was small and consisted of two openings corresponding to the claws of the hammer, side by side, one at the median line and another a trifle to the left and half an inch below the vertex; the other three-quarters of an inch to the left of the first wound. There was penetration with comminution and depression of the inner table. Broken bone was removed and the dura found intact; a small incision was made and a blood clot removed. This was on November 19th, 1903. The rise of temperature did not exceed 101 5° F. at any time, and it was in no way notable. The next day found him in excellent condition, the paralysis persisting with dysesthesia. November 24th there was a marked tingling sensation in the finger and hand; at 6:15 P.M. a partial return of power in thumb and forefinger. November 25th, again some power in hand and forearm. November 26th, there was a return of power in hip and knee and in shoulder. November 30th, the patient could touch both ears and place paralyzed hand on top of head. In early December, pronation was possible; toes and feet were still paralyzed, and he was discharged improved.

FRACTURE OF THE SKULL

Cranial fractures are usually divided into two kinds so far as location is concerned—namely, those of the vertex, and those of the base; and both may coexist, the fracture of the upper part of the skull frequently extending downward, although its detection is not always an easy matter (Fig. 14).

A



B

A. Fracture of the Base of the Skull from Antero-posterior Pressure. The patient, a man aged thirty-five, sustained a fall of ten feet on his head. At the autopsy this fracture, passing through the foramen magnum, was found. (Hutchinson's "Illustrations of Clinical Surgery," vol. i., Plate xxx.)

B. Transverse Fracture of the Base of the Skull, produced experimentally on the dead subject by forcible pressure exerted across the skull, the result being precisely analogous to that shown in Fig. *A*. (Helferich.)

The immediate recognition of the first kind should be made, if diagnosis is at all possible, by touch or inspection; but we must rely upon far less direct means for the detection of those at the base of the cranium, and, consequently, the chance for error is very great. In fact, these fractures are sometimes detected only after death, the patient perhaps succumbing to some other disease, his

FIG. 14.—Depressed Fracture of the Skull with Extension.

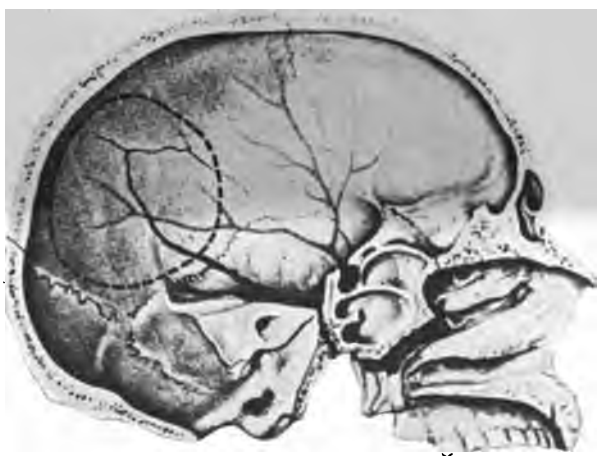
real trouble being unsuspected. The immediate recognition of fracture of the vault is possible by manipulation, or when a wound is present, by the direct examination of the exposed skull. Sometimes this is very difficult, especially when no comminution or depression exists where the scalp is intact, and the fracture is linear or stellate, or where it involves comparatively thick bone, or is concealed by dense tissue or muscular covering. Under some circumstances a compound fracture may be indicated by the peculiar tumid lump, which is known as

Pott's puffy tumor, the scalp being intact. In the case of a basal fracture a diagnosis is largely inferential, the significant indications in such cases being the escape of blood or serous fluid from some of the openings of the head, when we are able to judge with some accuracy as to the situation of the fracture.

Phelps has collected a very valuable series of histories, and in 286 of these there was a hemorrhage from the ear in one-third of all the cases, in which, after death, there was found a fracture of the petrous portion of the temporal bone; and hemorrhage of the nose in one-fourth of all his cases, in which fracture of the anterior fossa and anterior part of the middle fossa was found. In six cases in which hemorrhage from the conjunctiva occurred the anterior fossa was found to be the seat of the fracture, and in three cases in which buccal hemorrhage occurred the fracture involved the same situation. Fracture in the posterior fossa was connected with a subcutaneous extravasation behind the ear, and fracture of the mastoid process of the temporal bone caused the same local hemorrhage. The blood may come from the vessels of the diploë, or from the sinuses of the dura that may be opened, or from some implicated vessel. The escape of serous fluid from the ear was not found to have the great diagnostic importance that is popularly attached to it. Unless of immediate occurrence and in very large quantities it may mean nothing, and even then be due to other causes. Of course, the escape of brain matter from the meatus is a grave and indisputable indication of fracture, as is a true hernia cerebri.

Edema of the tissues over the mastoid region is generally recognized as an important result of fracture of the

A



B

A. Horizontal Section through the Skull with the Contained Brain, showing a large extravasation of blood from the middle meningeal artery between the brain and dura. This has been caused by a fracture through the temporal bone. The brain is compressed and displaced inward. (Hutchinson's "Illustrations of Clinical Surgery," vol. ii., Plate liv.)

B. Fracture of the Skull with Rupture of the Middle Meningeal Artery, from a workman, aged twenty, who fell from the fourth story of a house. On admission to the hospital there was an extravasation of blood in the left temporal region, as well as a perceptible fracture of the squamous portion of the left temporal bone, followed by escape of cerebro-spinal fluid from the left ear, and paralysis of the left side of the face and of both arm and leg on the right side. Death resulted from tetanus due to infection of a contused wound in the thigh. The drawing shows the position of an extravasation of blood from the posterior branch of the middle meningeal artery, together with the bifurcation of this artery, the line of fracture, etc. (Helferich.)

walls of the posterior fossa, as well as the temporal bone. Another important result of fracture of the base, which may be immediate or of later appearance, is the involvement of certain cranial nerves, and it is not uncommon as a consequence of a secondary meningitis to find implication of several of the important nerve trunks at the base of the brain. Those immediately injured, however, are the olfactory, trigeminus, optic, and the auditory nerves, for they all pass through delicate bony parts which are very liable to fracture. Cranial injuries, if of sufficient extent and severity, are likely to be followed by hemorrhage, contusion, and laceration of the brain and its membranes, and by thrombosis of the sinuses; and secondarily, by a variety of inflammatory conditions, to some of which reference has been made. Besides these there are certain indeterminate mental changes that cannot be regarded as occasional or mere psychological curiosities. Among these are moral perversities, peculiar phases of disturbed consciousness, and certain dramatic hysterical, and epileptoid states, as well as affections of speech. The immediate effect of the violence that produces the fracture and the shock are so familiar that they may be dismissed with few words. There may be a varying loss of consciousness and a depression of the vital forces, which is shown in a lowering of respiration and a fall of temperature if there be hemorrhage and compression.[1] Considerable elevation of temperature after fracture is an exceedingly bad sign, although a rise to 101° to 102° if not continued may mean nothing.

[1] Phelps held that the slowing of pulse and respiration found in most forms of compression is absent in that due to middle meningeal hemorrhage, which is often followed by spastic paralysis.

Facial asymmetry, exophthalmos, unilateral or double oculomotor symptoms, facial paralysis or spasm, are occasional objective evidences of the effects of fracture; while anesthesia, hemiplegia, or neuralgia of parts supplied by the fifth nerve; deafness, loss of smell or taste, or speech disturbance are central indications of deep mischief which may last for some time, disappearing gradually as the process of repair takes place and the fracture is healed. Certain permanent residual conditions of a lasting nature follow the destruction of nerve tissues or the pressure of exudates. Beside these, we may find various general motor and sensory conditions which will hereafter be particularized.

Under some circumstances the diagnosis of fracture is complicated by other diseases that may develop through its agency; for example, tuberculosis and syphilis. Fraser reports such a case.

CASE XVI.—The patient was a man who had received a fracture of the parietal bone by a brick that had fallen from a great height. He was at first insensible, but was able in the course of three weeks to return to his work. He suffered, however, from occipital headache of a severe character, and during the next fifteen months was deaf, and with this there were some amblyopia and a variety of symptoms suggestive of mental enfeeblement. He was stupid, of slow thought, and greatly depressed. A few months later his gait became ataxic; he had an inclination to fall backward, and presented the "circus movements" described by some authors as suggestive of cerebellar disease. In addition, there were double optic neuritis, with vertigo and vomiting, and difficulties in co-ordination. Subsequent examination revealed the existence of well-marked syphilitic indications, such as nodes, eruptions, and cicatrices, and it was determined to try the effect of specific treatment. Under the use of large doses of iodide of potassium his trouble diminished in severity and he rapidly recovered. In this case it is very probable that the blow was an

exciting cause of cerebral syphilis. Although the situation is not favorable for a *contrecoup* that would give rise to cerebral disease, it is possible that a diffused meningeal inflammation and deposit of gummatous matter took place as an extending lesion.

CASE XVII.—A personal case in which no fracture was found is that of M. R——, who received a severe blow upon the back part of the head some time in 1876, which rendered him unconscious. He, however, revived without any apparent serious consequences, and six years afterward was seized with sudden vertigo, nausea, and vomiting, which lasted several days. Six months later his legs became weak, and there was double vision. Three months after this his speech became affected, there being considerable awkwardness in enunciation, with difficulty in co-ordination of the movements of the right upper extremity, and he walked with a tottering gait, spreading his feet far apart. When seen by the writer in December, 1883, he presented the motor symptoms above enumerated, with added facial paralysis on the right side and increased knee-jerk on the same side; his tongue protruded, pointing to the right. His hearing was good, and there was some ptosis on the left side. On April 23d, 1884, there was hemianesthesia of the right side of the body, and the hearing had become dull in the right ear. Since his last visit there had been right facial neuralgia, and increase of the ataxia and unsteadiness, and exophthalmos of the right eye, with no sugar in the urine. He was seen by Dr. C. S. Bull on April 21st, 1884, who found a rotatory nystagmus, a paresis of the right external rectus and left internal rectus. He could not contract the right orbicularis palpebrarum alone, though he could in connection with the left orbicularis.[1] The palpebral aperture on the right side was wider than on the left, through excess of action on the part of the levator. The pupils were normal in size and reaction. The nystagmus was more marked when he was not fixing any object with his eyes, and when he looked toward the left it was accompanied by a marked clonic spasm of the right internal rectus and left external rectus. There was also deficient action of the right inferior oblique

[1] This phenomenon, which has recently been called the "orbicularis sign," has been advanced as a diagnostic test, it being found by G. W. Jacoby (American Neurological Association Report, 1903) to exist in hemiplegia of central origin.

muscle. He was hypermetropic. The field of vision was norm and there was no special pathological change in the retina nerves. The patient's symptoms increased, and he died Ju 20th, 1884, of exhaustion. Two weeks before death there was increase of occipital pain, which was only controlled by morphi The lungs were healthy. At the autopsy there was found in left lobe of the cerebellum beneath, a tumor the size of a sm egg and consisting of apparently broken-down tissue. The p was not involved, save as it might have been from pressure. So fluid was found in the lateral ventricles. Other parts of t brain were healthy, except that the entire bulk of the bra seemed increased. Dr. Lyle Smith, who was present at t autopsy at the patient's home in Hudson, N. Y., informed m that there was not only a family history of phthisis but every e dence that the growth itself was tuberculous. It is to be gretted that no more extended examination was possible, and th the microscope was not used.

Occasionally in the determination of death fro alleged violence the arterial degeneration, due to alcoh ism and other factors, must be taken into consideratio and it does not do to be arbitrary or to dismiss contrib ing causes of various kinds, among them old cardi affections and epilepsy. A delicate medico-legal poi may also arise in those cases in which the patient d from tetanus after a severe wound.

Localization and Symptomatology.

The localization of cerebral disease necessitates knowledge of experimental physiology of the nerve system, as well as the appreciation of the teachings pathology and clinical neurology; but anything more tha a mere presentation of a suggestive synopsis of symptom and their relation to definite lesions for the purpose diagnosis would be out of place in a book of this kin

and the reader is referred to any of the standard neurological text-books.

The localization of function in the cerebral cortex and the expression of destruction or injury of particular parts may be made with reference to motor and sensory areas, the nature of which is now pretty well understood (see Appendix, Charts 1 and 2).

MOTOR AREAS.—*Larynx*, *lower jaw*, *pharynx*, *tongue*, lowest quarter of both anterior and posterior central convolutions.

Face, anterior and posterior central convolutions immediately above the preceding centres.

Upper extremity, middle half of anterior and posterior central convolution, reaching a little higher up on the anterior than the posterior one. The centres for the thumb and index finger are at the lower end of this region; the centre for the shoulder at the upper border. According to some authors, the centres for the extensor muscles are on the anterior and those of the flexors on the posterior convolution. All agree that the anterior convolution is of greater importance for the motor function.

Lower extremity, upper quarter of central convolution and paracentral convolution. Opinions as to localization of central parts differ; it is generally assumed that the hip and knee centres are located in the lowest part and the foot centre in the highest part, and in the paracentral convolutions.

Thorax, posterior part of superior frontal convolution. Some authors localize the muscles of the thorax in the cerebellum.

Motions of head and eyes (conjugated), posterior part

of first and second frontal convolutions. It is generally assumed that this centre effects a voluntary turning of the head and eyes toward the opposite side. There are a few other centres for the innervation of the eye muscles, *i.e.*, in the lower parietal and in the occipital convolutions.

Some authors claim that the gyrus angularis has special relations to the eye muscles, and that lesions in this region may produce disturbances in accommodation. According to some writers, there is a centre for the contralateral pupil in the gyrus angularis.

Vasomotor centres are supposed to be in the central convolutions, especially for the opposite half of the body. These, however, are found only in apes, and are very uncertain in man.

SENSORY AREAS.—No uniform view has been reached regarding the localization of sensation. Some authors identify the centres of sensation with the motor centres (Munk). Others enlarge the sensory area and ascribe this function especially to the gyrus fornicatus (Ferrier, Horsley, Flechsig). Others, again, deny the relation of this region to sensation (Hitzig).

Speech.—Motor, posterior part of third frontal convolution. *Sensory*, posterior two-thirds of first temporal convolution.

Sight.—Occipital lobe, especially fissura calcarina, and cuneus. Some authors add to this the first occipital convolution, gyrus fusiformis and lingualis. The rest of the occipital lobe as well as the gyrus angularis is claimed to play a rôle in turning optic sensations into conceptions.

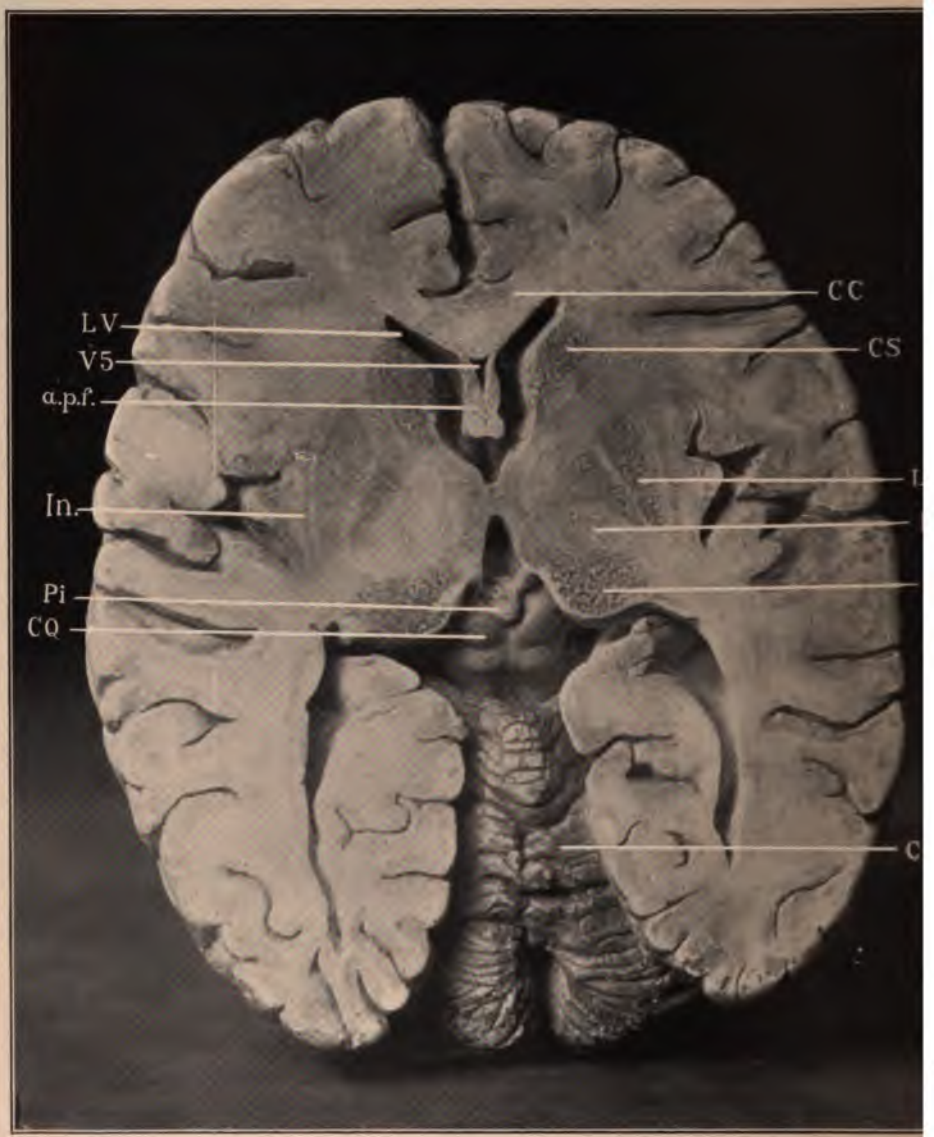
Hearing.—Upper temporal convolutions.

Smell.—Gyrus uncinatus.

Taste.—Anterior part of gyrus fornicatus.

referred to him by the late Dr. C R Agnew, under whose care he had been. In 1863, at the battle of Gettysburg, he received a head wound, a bullet entering the left orbit, leaving on the right side after passing obliquely behind the ridge of the nose and out of the right orbit between it and the eyeball. There had apparently been no injury of the right eye. He was unconscious and delirious for seven days, became blind, and lost the sense of both smell and taste, the former permanently. In October, 1863, the left eye was removed, the operation being followed by an agonizing headache, which lasted for months, by numbness of parts supplied by the lower branch of the fifth nerve on the right side, and at times by severe pain of the scalp and in the upper frontal region. By this time attacks of vertigo, with confusion of memory, occurred when he also had hallucinations of smell, perceiving odors that were not unpleasant. At these times there was contraction of the field of vision, but no diplopia or hemiopia. At times he talked thickly, and there was an apparent temporary amnesia. These attacks occurred occasionally, but in the interim his mind was clear. His wife said she had noticed twitching of the left side of the face. His hearing was good. He could not detect the difference between cologne, ammonia, camphor, or acetic acid, yet he said he could distinguish between the odor of an apple and a pear, or of a peach and an apricot.

The *centrum ovale* as well as the *corpus callosum* may be involved without any conspicuous or distinct symptoms, except in the former case, when the lesion is in possible close proximity to the cortical centres. Tumors in the corpus callosum often give rise to mental dulness, delusions, and dementia, and to vague and inconstant motor symptoms, notably a hemiplegia which shifts. Should the internal capsule be the seat of a lesion at all extensive there will be hemianesthesia, hemiplegia, possibly hemiopia, and paralysis of muscles supplied by the facial and hypoglossal nerves. Various limited forms of trouble are connected with focal lesions in this locality and there may be a paralysis of the facial and hypoglossal nerves



HORIZONTAL MID-SECTION OF BRAIN.

LV, Lateral ventricle; *V5*, fifth ventricle; *CC*, corpus callosum; *CS*, corpus striatum; *LN*, lenticular nucleus; *IC*, internal capsule; *OT*, optic thalamus; *In.*, insula; *a.p.f.*, anterior pillar of fornix; *Pi*, pineal gland; *CQ*, corpora quadrigemina; *C*, cerebellum.

alone. Of course double lesions produce a corresponding diplegia. Lesions of the optic thalamus are associated with occipital headache, disturbances of a mental kind, and with muscular inco-ordination, rotatory movements to the side of the lesion, and optic neuritis. Should there be a posterior lesion, there is likely to be hemiopia. Lesions of the *corpora quadrigemina* give rise to a peculiar ataxic gait, to loss of appreciation of change in the position of the limbs, and to oculomuscular paralysis. If the "tegmental" fibres beneath are involved, it is quite probable that there will be hemianesthesia. Lesion of the crusta will give rise to a crossed brachiocrural hemiplegia. As some of the fibres of the optic nerve take their origin in these parts, it is quite likely that under certain circumstances there may be a complicating hemiopia or atrophy of the optic nerve, and possibly association of some disturbance of hearing, the auditory nerve being involved as well. Crossed hemiplegia with paralysis of the third nerve on the side of the lesion and with paralysis of the extremities of the other side is also to be looked for. Disease of the *pons* is characterized by "crossed" or alternating paralysis if the lesion be in its posterior part, when the hemiplegia will be on one side of the body and the facial paralysis on the other. Focal lesions are usually followed by disturbance of some of the nuclei of the cranial nerves or by fibres of others which pass through them—among them the fifth, sixth, and seventh. Such lesions are manifested by facial paralysis and by pain or anesthesia if the seventh and fifth nerves be involved, and there is a paralysis of the external rectus in addition to a hemiplegia. If the sixth nerve be implicated, the eyes in consequence turn toward the paralyzed side. Tonic spasm of paralyzed limbs in

connection with diseases of the pons is not unusual. If there be a bilateral lesion, there is double paralysis not only of the face, but of all four extremities, with contraction of both pupils.

Lesions of the *cerebellum*, both extra- and intramedullary, are indicated by disturbance of equilibrium. The patient staggers and suffers from vertigo when in the upright position, and vomiting is common. Headache in the occipital, frontal, and temporal regions is commonly associated, nystagmus often occurs, and optic neuritis occasionally. There is often in the extramedullary variety weakness of the face and limbs, which is hemiparetic. The unsteadiness referred to causes the patient to totter or fall; but there is no rule about this. It is rare to find cerebellar disease without some implication of the cranial nerves.

CASE XIX.—E. C. M——, a mail clerk, received a basal fracture with evident injury of the cerebellum. He was engaged sorting mail in a car attached to a train of the New York and New Haven Railroad Company on July 25th, 1893, when the car swerved from the temporary track and collided with a passing train, the result being that much of the side of the car was crushed in and the man was seriously injured.

"There was a scalp wound about two and one-half inches in length on the back of the head running horizontally, just below the occipital protuberance. Profuse hemorrhage was taking place from the right ear, and there was hemorrhage into the right orbit, the eyeball being much discolored from extravasated blood. During the forenoon the patient was only partially conscious; hemorrhage still continued from the right ear.

"There was a spot in the back, in the middle dorsal region, where there seemed to be some tenderness, and it was a question whether there was a depression there or not. No fracture or dislocation of vertebræ was diagnosed, and there was no paralysis of any kind. A diagnosis of the fracture of the base of the skull

was made, and his recovery was considered doubtful. His mental condition varied greatly, and at times he was semiconscious, being roused with some difficulty, while at others he was delirious, and again slept naturally. Gradually this subsided, and on the 27th he was comparatively rational, answered questions quite well, although slowly and hesitatingly.

"From July 28th he complained a good deal of pains in the right side of his head. These persisted for two or three weeks with varying intensity, and not yielding readily to treatment.

"On August 3d his eyes were examined. He had an ulcer of the right cornea with slight conjunctival injection and remains of a conjunctival ecchymosis. There were neuroparalytic keratitis and paralysis of the internal recti with crossed diplopia.

"The afterpart of Mr. M——'s stay in the hospital was uneventful, gradual improvement taking place. There were two symptoms, which during his stay were noticeable: hesitating speech and unsteady gait. The hesitating speech was as if the word wished for came slowly at his command, but rightly. The unsteady gait was at the time ascribed to weakness from confinement and consequent disuse of the muscles of locomotion. He left the hospital September, 1893.

"On March 6th, 1894, Mr. M—— was examined again. The same unsteadiness of gait was noticed as during his stay at the hospital, but it was decidedly less marked. He could not stand erect with eyes closed without swaying unsteadily. The same was true when the eyes were fixed on the floor at his feet.

"On examining his head there was found a linear horizontal cicatrix about one and one-half inches in length and about one-quarter to one-half of an inch below the occipital protuberance. No special tenderness of the scar.

"There was no indication of any abdominal trouble; no tenderness in the pit of the stomach, no cough. There was complaint of some pain in the lower scapular region on the right side, but no localized tenderness was found.

"Examination of the eyes: There is a slight macula of the cornea of the right eye. The pupil is slightly dilated, and is not so responsive to light as that of the other eye. Vision of the right eye is 0.7. There is .75 dioptre of hypermetropia. Vision of the left eye is the same. There is at times double vision, and with a red glass before one eye there is at once a crossed diplopia.

"There is an insufficiency of the internal recti of one degree a twenty feet and of ten degrees at fifteen inches, by both Steven and Maddox's tests for insufficiency of the ocular muscles. Afte repeated testing and consequent exercise of the muscles the diplo pia at twenty feet disappeared, but remains the same at the nea distance. The ophthalmoscopic examination was made with a d lated pupil. Right eye: Disc is markedly cupped with edges c excavation fairly well marked, and about five dioptres deep. N other notable condition was found. Left eye normal in appearanc Tension of each eye normal. Field of vision normal.

"Right ear: Hearing distance normal. Drum membrane i normal in appearance, but slightly hyperemic, and with a red dened scar extending downward and forward from two lines an terior to the tip of the manubrium to the annular ring. Left ear Hearing distance for watch 0.06; voice twenty feet; whispere voice eight feet. Drum membrane is dull and retracted, bu freely movable. Reactions to tuning forks of vibrations fro 128 to 2,048 show no deviations from the standard.

"In our opinion the patient suffered from concussion of t brain, with a fracture of the base of the skull and severe sho narrowly escaping a fatal termination.

"As a result of the general physical examination, we find, wh with the exception of subjective symptoms, as pain, loss of me ory, etc., which are incapable of demonstration, there are *bu* two which would indicate any probable permanent injury to the general system—namely, hesitating speech and unsteady gait."[1]

"The patient consulted the writer May 7th, 1895. He was a broken-down, unhealthy looking man who walked with some diffi culty and slightly dragged the right foot. He was exceedingly pale, and tired easily. He lacked concentration, and had beer unable expeditiously to sort his letters, and continued applicatio was likely to produce headache and some mental confusion. H could formerly do twice as much without trouble, and had gon to work again, as he said, to reassure his wife, who had been suf fering for some time with some depressed form of mental disease manifested by anxiety in regard to his welfare. Both eyes wer

[1] Examination by Drs. J. T. Rogers and Godding at the Rhode Islan Hospital, from whose reports these notes are taken.

red and suffused. He presented a depression at the occipital region with some loss of substance of the scalp, and beneath this spot he said there was constant pain, which was increased by mental exertion, and was aggravated when he lay down when he became dizzy. When the head was retracted, there were also pain and a tendency to fall backward, which he had to resist. His speech was decidedly affected, there being motor aphasia, and at times he was at a loss for a word, or paraphrased. There were occasional double vision and ocular pain, and when pressure was made over the eyeballs there was some tension indicative of commencing glaucoma. Both optic nerves were to some degree excavated and both eye fields congested. The right pupil was larger than the left, and there seemed to be inability completely to close the right eye. His vision was decidedly affected on the right side, and he complained of haziness and blurring, which, however, was not always constant. Hearing in the left ear was impaired. There was some anesthesia of the right side of the face which involved the gums, as well as a loss of smell, which, however, was not marked. The reflexes were increased on the right side, and the patellar tendon reflex especially. He could not stand with closed eyes without swaying to a very decided degree. There were no disturbance of co-ordination in the upper extremities and no pathological atrophy. The functions of his bowels and bladder were also unimpaired, and there was nothing to indicate spinal disease.

The case was settled for a comparatively small sum. This man, I believe, subsequently became blind.

CASE XX.—A case of cerebellar tumor of traumatic origin was seen by the writer in consultation with Dr. L. R. Morris, November 4th, 1898. The patient was a little girl of six, who in March, 1897, had fallen violently, striking the head over the occipital region. There was no loss of consciousness, vomiting, or subsequent headaches, and the only external mark was a large hematoma. A month later she had another fall, unattended as well by any immediate evil consequences. In the spring of 1898 she complained of occasional morning headaches, and in May or June her mother and aunt noticed a "cast in one eye" and certain motor difficulties and strange attitudes, the head being seemingly "pushed forward and fixed." The child became thin,

listless, and had "a tired look," and in August had morning nausea and vomiting, with severe headaches, photophobia, and there was a marked internal strabismus of the right eye, with lateral nystagmus, dilatation of the right pupil, the ocular defects being inconstant; but later there was a fixed crossing. The tendon reflexes were slightly exaggerated and the pupillary reflexes sluggish. In October, 1898, there were tremor of the hands, static ataxia, with tendency to fall forward, and a peculiar rigidity, which prevented her from bending forward from the hips, so that she could not pick objects from the floor unless she planted her feet well apart, flexed her thighs, and threw back her head; then with the left shoulder slightly raised and the muscles of the neck rigid she could with her right hand grasp articles placed in front of her at her feet. Her head was not rigid except when walking or sitting; she had cramps in the right leg and clonic convulsions lasting about a minute each, when there would be a "kicking motion." No pain was produced by pressure over the scar. She shortly afterward became apathetic; there were shooting pains in the head, radiating from the occipital region, delirium and shouting. The bowels moved only by enemata; the urine was voided involuntarily at times at first, afterward constantly. Finally she could not speak nor could she be aroused. Her hands and fingers were flexed and thumbs turned in, most constantly on the left side; her feet were extended and her toes flexed. On November 20th there were two general convulsions, with clonic movements of the feet, legs, hands, and arms, lasting half an hour and not preponderating on either side. During convulsions both eyes were drawn inward and downward. There were subsequent loss of deglutition, Cheyne-Stokes respiration, increase of trembling and contraction, and death from respiratory failure December 13th. For almost a month she was fed by enemeta. Dr. John R. Weeks, who saw her, found a slight loss of power of the externi, which subsequently became marked, especially on the right side; there was sluggishness of pupils to artificial stimulation on November 6th, with moderate dilatation, and later, November 21st, the eyes were fixed and the irides did not respond to light. There was almost complete ophthalmoplegia externa and interna, which lasted until death. At Dr. Weeks' first visit ophthalmoscopic examination of fundus disclosed papillitis in both eyes with elevation of about two-thirds of a millimetre (Fig. 15). There was

serous exudation on the temporal side and below the disc in the right eye, with engorged and tortuous veins and small arteries.

From the ocular symptoms—vomiting, headache, uncertain gait, pitching forward, convulsions, apathy, and general symptoms, I made a diagnosis of a median cerebellar tumor, with hydrops ventriculi. At the autopsy the convolutions were found to be flattened, the pia rather more injected and drier than usual, and when a longitudinal incision was made through the corpus callosum and the hemispheres were separated, there was found a brownish-red

FIG. 15.—Papillitis with Detachment.

tumor about the size of an egg lying in the median line and touching the cerebellum. The mass, about 4.5 cm. in length, 4 cm. in width, and 4 cm. in depth, was situated in the cavity of the third ventricle and reached forward and downward into the optic recess and infundibulum. Separating the thalami, it displaced upward the roof of the third ventricle and obliterated the posterior pillars of the fornix; it here lay in contact with the corpus callosum. Extending backward and downward it destroyed the pineal gland, overrode the lamina quadrigemina, compressing under it the aqueduct of Sylvius, separated the corpora quadrigemina, and reached to the tip of the valve of Vieussens. The fourth ventricle was intact, and the aqueduct still patulous, but very small. The lateral ventricles were found full of a thin red-

dish fluid, and their surfaces were stained yellow. Projecting into the right ventricle from the foramen of Monro was a cyst formed by the velum and filled with a bloody fluid. There were about six ounces of fluid in the cranial cavity. On section of the tumor a dark-red surface is apparent, looking for the most part like clotted blood. A considerable area near the superior surface is

FIG. 16.—Cerebellar Tumor.[1]

lighter in color and of a spongy texture. There is the appearance as if several hemorrhages had occurred at different times splitting up the new growth and forming clots. The structure of the tumor is that of a small round-cell sarcoma augmented by repeated hemorrhages.

Disease of the *medulla* is expressed by symptoms indicative of irritation or destruction of the cranial-nerve nuclei at the floor of the fourth ventricle, and paralysis of the extremities on one or both sides. When death is not immediate, the cranial-nerve symptoms are progressive and develop slowly.

Disturbance of function of the *cranial nerves* must be studied with relation to their deep origin, course, and

[1] This and preceding cut from Medicine, July, 1900.

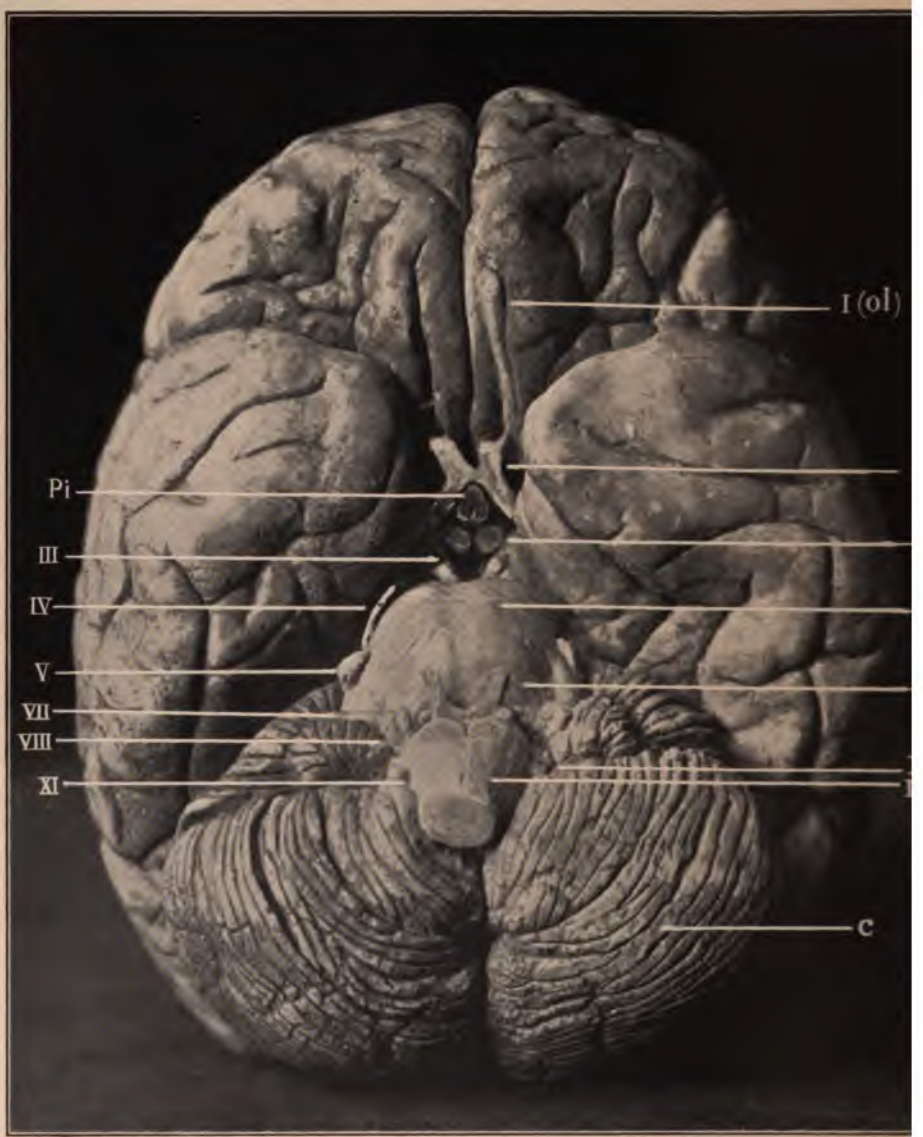
peripheral distribution, and at the same time with relation to the complete or partial decussation of their deep fibres; for instance, the *olfactory* nerve has no crossed fibres, while the course of those in the optic nerve is most complicated and incomplete. Injury of the former is unilateral so far as loss of smell is concerned, while if one of the crura of the optic nerve be injured, we are furnished with the so-called *homonymous hemianopsia* which is attended by loss of vision of the same side in both eyes.

Disturbance of the sense of smell may follow falls with shock as well as from destructive disease, the loss corresponding to the side upon which the lesion is situated. It may also be due to meningitis at the base of the frontal lobe. When the *optic* nerve is involved, we ordinarily find neuritis and choked disc, due to interference in the return of *venous* blood through pressure (Fig. 17) or disease, or with destruction or irritation of the deeper parts and nerve nuclei; amaurosis and amblyopia are produced. Sometimes the papilla is the seat of inflammation and swelling when the appearance depicted in Fig. 16 is found.

FIG. 17.—Distention of Optic Nerve Sheath and Compression of Nerve.

In cerebral sclerosis and as the result of various deep structural lesions we find atrophy of the optic nerve and its ocular expansion. Hemianopsia may be due to dis-

[1] From Medicine, July, 1900.



BASE OF BRAIN.

I (ol), Olfactory nerve; *II (o)*, optic nerve; *III*, oculomotorius; *IV*, patheticus or trochlear nerve; *V*, trigeminal nerve; *VI*, abducens nerve; *VII*, facial nerve; *VIII*, auditory nerve; *X*, pneumogastric nerve; *XI*, spinal accessory nerve; *Pi*, pineal gland; *ca*, corpora albicantia; *P*, pons; *mo*, medulla oblongata; *c*, cerebellum.

It is rare for these three nerves to be affected together, and in such a case the general paralysis of the eyeball is known as ophthalmoplegia; but this condition is rather due to alcoholism or some other form of general brain disease than trauma.[1] The *trigeminus* or *fifth* is a mixed nerve containing sensory, motor, and trophic fibres. It is concerned in the innervation of the muscles of mastication, and has as well wide and important sensory offices, for its fibres supply not only the gums, tongue, teeth, ear, face, and part of the pharynx, but the scalp as well, and it is in a measure concerned in the trophic supply of the cornea. As a result of irritative or destructive lesions we find spasm or automatic movement, or perhaps paralysis of the masseters, anesthesia of the face, corresponding to the distribution of the three branches, vertical or facial neuralgia, loss of taste in the anterior third of the tongue, noises in the ears, or sometimes ulceration of the cornea. The injury may of course be superficial or deep, and in the former there are usually areas of incomplete anesthesia, while in the latter it is not unusual to find that other cranial nerves are involved as well, with additional special symptoms.

CASE XXI.—An illustrative case is that of a man who came under the writer's notice in October, 1890. He had been injured in a railroad wreck on the Hamilton and Dayton Railroad, and was picked up unconscious, remaining so for several hours, and for a long time suffered from shock and acute pain confined to the right side of the head; there was much irritability of temper, as well as periods of nervous excitement, and more or less insomnia. The patient, when he came a year after the accident, presented two scars, one about two and one-half inches

[1] Ophthalmoplegia may be *external* or *internal*, depending upon the muscles involved.

long over the frontal bone a little to the right of the media line and about an inch above the superciliary ridge. The latte bore the traces of slow healing, due to the escape of piece of bone, which were exfoliated from the outer surface of th skull and had been removed from time to time. There wa ptosis of the right eye, which existed almost from the time the accident, and he had complained of diplopia depending upon paralysis of the muscles of the right eye; his right pupil was sensitive to light and somewhat dilated. There was a limitati of the field of vision on this side, the constriction being almost h that of the other eye. Disturbance of the seventh nerve w manifested by slight paralysis of the right side of the face, whic was apparent in a grade of deformity when he laughed or pe formed other suggested acts, and injury of the fifth nerve wa shown by anesthesia of the gums of the upper jaw on the righ side, and he had already lost several teeth as a result of trophi change. There was an apparent loss of the sense of smell, although his taste was but little affected, and only in the front part of th tongue. His motility was slightly impaired on the left side of th body, especially the left leg; but the reflexes were unaffected. I this case there was evidently a transmitted fracture of the ba with meningitis and involvement and injury of the third, fifth, an seventh nerves. The case was settled for a large sum, and ther is no doubt of its seriousness or progressive character.

The *facial* or *seventh* supplies all the facial muscles except those innervated by the fifth and third nerves. As a consequence of deep disease, it is not rare to find a extensive loss of function, which may be due to periph eral changes, and consist of spasm and paralysis. Th *auditory* or *eighth* is the nerve of hearing, and its injur is followed by deafness as well as by certain minor disturb ances of hearing. The paralysis, if central, may follow cortical lesion or injury of the other central nuclei. peripheral injury of the seventh will result in complete f cial paralysis, for the central variety is apt to be expresse only by a loss of power of those muscles supplied by the tw

lower branches of the nerve, the patient being able to close his eyes and wrinkle the forehead, and there is no reaction of degeneration, as when the terminal branches of the nerve are paralyzed. In the central form the reflexes are preserved, while in the peripheral they are lost. With paralysis of the auditory nerve alone we sometimes find subjective noises, which are constant and distressing.

The *glosso-pharyngeal* or *ninth* nerve supplies the posterior third of the tongue, and, therefore, loss of taste in this situation may be found. It is contended, however, that the back of the throat derives its sensory innervation largely from fibres of the fifth pair.

The *pneumogastric* or *tenth* and spinal accessory or *eleventh* are nerves of great importance, presiding over respiration and digestion. Traumatic cases are not common, but when found are usually obscure. The trunk may be wounded, or a series of interesting symptoms may follow the creation of a deep lesion. If the spinal accessory and hypoglossus nerves are involved together, we are furnished with a train of symptoms which constitutes the well-known bulbar paralysis. With injury of the vagus or sensory branch, we find anesthesia of the larynx, atrophy, and various forms of spasm and paralysis, among them esophageal and laryngeal spasm, tachycardia, convulsive asthma, and angina pectoris. Graves' disease, or exophthalmic goitre, is by many recognized to be a traumatic affection of this nerve, and doubtless many neuroses often follow shock in which it is implicated.

A bulbar lesion may affect the *hypoglossal* or *twelfth*, leading to paralysis and atrophy of the tongue and twitching or spasm of the jaws.

Case XXII.—Hirsch reports a mixed traumatic injury of t hypoglossus, vagus, and sympathetic, the patient being a labor who accidentally shot himself, the bullet passing through the ro of the mouth and lodging at the left of the fourth cervical ver bra, where it was afterward found in the sternocleido muscle a removed. As a consequence of the injury, there were paraly of the left velum palati, paralysis of the left vocal cord with loss voice, vomiting, and paralysis of one side of the tongue. The was pronounced secretion of saliva, which accumulated under t left side of the tongue, and the left pupil diminished in size, wi slow reaction to artificial stimulation. There was no loss of tas Paresis of the muscles of the left half of the thorax was found, increase in the rapidity of the heart's action took place, the cou averaging 108; but there was at times a decided tachycardia.

General Symptomatology.

Brain lesions are recognized as *general*, *indirect*, an *focal*. The symptoms of the two former are so irregula and so often presented in a varying number of condition as to lead to difficulties in diagnosis, but when associate may be always suggestive of cerebral disease, thoug they may have a widely different significance. Th symptoms of general lesions are usually transitory, pas ing away in a comparatively short time with the relief certain conditions, or obscuring the cause of death shou there be a fatal termination; while the focal lesions a often permanent and are manifested by more or less de nite expressions, such, for example, as a lasting aphas or paralysis.

General symptoms, then, usually mark a widely e tended disturbance, and include changes in the pulse pain, vomiting, delirium, loss of consciousness, lowerin or increase of temperature, respiratory changes, et which, for instance, may follow compression or shoc there possibly being at the same time a local destructi

of tissue, which afterward makes itself known in persistent expressions of mischief. Indirect lesions include, for instance, such symptoms as hemiplegia, which may disappear quickly, while the hemiplegia of a focal lesion may imply the permanent destruction of a specific motor tract. It is therefore often a matter of great difficulty to localize by means of symptoms, and we must take into account their mode of onset as well as their association with others, and, perhaps, the existence of a previous confusing symptom, due to a lesion that has existed for some time. Hirt says in this connection: "That even apart from the mode of onset the symptoms are not of equal value in the localization. Some, it is true, as hemiplegia, together with crossed lateral oculomotor paralysis, are almost pathognomonic of a lesion of the crus, and their simultaneous appearance is felt, therefore, to be extremely important; while others, as conjugate vision in severe hemiplegia, are found in different lesions, and are therefore less significant. Still others, as optic neuritis, all general symptoms, headache, vertigo, and unconsciousness, are absolutely valueless."

Lesions may be roughly classified as those of the cortex, of the midbrain, and of the basal ganglia and cranial nerves. The former, thanks to the labors of Fritsch, Hitzig, and Ferrier, as well as of those who have followed them, is comparatively easy. The symptoms may be regarded as due to irritation and destruction, the latter being more serious. Considerable difference exists between the extent of function of the areas of the cerebral cortex of the right and left sides of the brain; but it is well known that the latter is not only, as well as the right, the seat for motor areas, which occupy the central con-

volutions, but that several important sensory centres o the cortex are confined to this side.

Motor Disturbances.—Among the commonest symp toms of cerebral disease are spasm, convulsion, tremo ataxia, and paralysis. Lesions of that part of the cerebra cortex in which the motor centres are situated, and whic have previously been described—or of the meninges i juxtaposition therewith—are apt, if irritative, to lead t monospasm or convulsions, which are more or less ge eral. If there be constant pressure or destructive disea of these areas, there may be a permanent paralysis up the opposite side of the body, associated perhaps wi convulsions. The cortical motor lesions must be dist guished from others at the lower level of the brain, wh the motor tracts are simply cut across or destroyed. destructive lesion of the motor apparatus, if sufficient extensive, may give rise to a paralysis of the face and the upper and lower extremities on one side of the bo (hemiplegia), or if the lesion be bilateral or at some poi of decussation of the motor fibres it will be double. Th arm in hemiplegia is ordinarily more profoundly par lyzed than either the lower extremity or the face, and, a a rule, the patient can use his leg long before he can hi upper extremity, and in all forms of cerebral paralysis th distal parts present a more extreme loss of power tha those nearer the trunk. As a late result of serious brai lesions giving rise to paralysis, there is in some case descending degeneration attended by pain as the resul of an associated neuritis, with possibly spastic contrac tures and increased reflexes. In profound paralysis a the beginning, there is a diminution or loss of both kind of reflex action. What is known as the *Babinski sign* i

a reflex extension of the great toe in response to irritation or tickling of the sole, and is a reliable indication of that form of degeneration which so often takes place after a cerebral lesion of the motor tract. The *ankle clonus* obtained by forcibly flexing the foot is essential and indicative of organic disease. Allusion has already been made to the "combined flexion of trunk and thigh reflex" of Babinski.

Cerebral disease, especially if there be irritative lesions of the cortex, is apt to be manifested by convulsions either unilateral or general (Jacksonian epilepsy), or by loss of consciousness. These often originate as the result of an increase of intracranial tension, due to compression made by depressed bone, by purulent or other accumulations, and by neoplasms. Loss of consciousness, however, does not necessarily follow, and a form of hemiplegia, due to cortical disturbance, may be associated with violent convulsions of the paralyzed limbs, with little or no appreciable loss. In other cases convulsions, due to involvement of the cortical motor centres, may end in transitory paralysis. What are known as *associated movements* take place in paralyzed limbs when some voluntary movement is made on the other side of the body, and are automatic. For example, if a patient grasps an object with his sound hand, the act will be accompanied by a certain amount of flexion of the fingers of the other hand.

Tremor occurring in the course of brain disease is often associated with multiple sclerosis, and is increased by voluntary attempts, and is general, while twitching of isolated muscles or filaments may be an expression of disease of the motor centres as well as a peripheral symptom of disturbance of certain cranial nerves.

Ataxia, which is also found in disease of the posterior columns of the spinal cord, may be one of the indications of cerebral as well as of cerebellar disease, and may be connected with general unsteadiness, rotatory or propulsive movements in different directions, a tendency to fall backward or to one side, and other disturbances of equilibrium, as well as vertigo. Care should be taken to differentiate the kind associated with auditory vertigo (Ménière's disease) from that of genuine cerebellar disease.

Sensory Symptoms.—Head pain is an important indication, is common, and varies greatly in its appearance, expression, and intensity. This is especially true if the meninges be affected, when it is often exceedingly severe, general, and persistent, and accompanied by tenderness, especially when the scalp and underlying bones are subject to pressure. The head pain is often aggravated by intellectual fatigue or effort, or by exposure to extreme heat, violent efforts, and other agencies that favor hyperemia or congestion. When the cerebral membranes are inflamed, the pain is accompanied by a sense of pressure and constriction, and it is at times paroxysmal. Various forms of peripheral pain, due to neuralgia or neuritis of the fifth pair, may, as a result of trauma, follow incomplete fracture or actual injury to the nerve trunk itself, and these morbid states may terminate in anesthesia. A fracture of the posterior fossa is quite apt to be connected with pain in the suboccipital region, and it is a more or less important diagnostic symptom of basal fracture. Obstinate neuralgia is apt to be expressed by tender points which are left after the paroxysm has subsided. Central hemianesthesia may be consecutive to lesions of the cortical sensory areas or of the internal capsule, and

is often found with hemiplegia, but disappears before the paralysis. Lesions of the occipital lobe are symptomatized by the retinal anesthesia with unilateral blindness already mentioned.

Much of the interest attached to the sensory disturbances in connection with cerebral disease is due to psychic defects and disturbances of perception. Not only may a pin prick at a distal point be tardily felt as the result of disease of the receptive apparatus, or of belated conduction, but a sluggishness of mental recognition as a feature in itself should be recognized. The mental integrity which enables the individual to respond to direction, location, weight, and temperature tests may be deficient, and in disease perhaps of the parietal lobule there may be loss of muscular sense which prevents him from knowing the location of his limbs when he is blindfolded, and when they are subjected to certain passive movements and changes in position.

Speech disturbance in connection with head injuries may be classed with headache and vomiting as important indications of cerebral mischief. Aphasia (which ordinarily means the loss of power of intellectual speech, in contradistinction to aphonia and alalia, which are usually due to defects in the peripheral apparatus) is dependent, as has been shown, upon the lesion of the third frontal convolution. It is really an inability on the part of the patient to use the word-symbol, and as a result he employs some other unsuitable word. He is able to recognize his mistake when it is pointed out to him, but is usually unable to do any better upon a second attempt if the loss be at all profound. Word blindness (*alexia*) and word deafness are two conditions which are also forms of

aphasia, and are sensory defects; the one consisting in an inability to speak written or printed words which the individual sees and is unable to speak when he attempts to read aloud; the other is lost ability to repeat words spoken to him. In either case these do not depend upon any intrinsic disturbance of the eye or ear, but rather upon some cortical lesion: in the one case situated in the angular gyrus (?), and in the other in the posterior part of the first and upper part of the second temporal convolution. These are often associated with *aphemia*. There is also loss of ability to recognize gestures or signs of objects (*apraxia*). Sometimes the patient is unable to write, though he can speak, and this loss (which is due to a lesion which destroys the brain centre which presides over writing) is known as *agraphia*. These patients may be able to write, sing, or gesticulate when they cannot speak, and it is not common to find *asemasia* or *asemia* (Steindhal), which is an inability to understand any sign or symbol of thought, whether spoken, written, or acted.

These interesting disorders of speech are usually indications of grave, although not necessarily incurable disease. In a number of instances shock or hysteria will give rise to a spurious aphasia, which is, after all, mutism. The affection, as a rule, is due to some form of cortical degeneration, and that following thrombosis and rupture of a cerebral vessel is the most common. It is true that during Bright's disease attacks of aphasia may occur from time to time as the result of the uremia, and there are minor congestive disorders that give rise to aphasia as a functional affection.

Trophic changes consecutive to disease of the brain are presented by those whose condition is one of chro-

nicity. The muscles become degenerated and shortened, and there are resulting contractures and atrophy, and the faradic excitability is reduced. In old cases arthropathies may develop, just as they do in posterior sclerosis. Bed-sores form as a result of lowered nutrition, differing in no respect from the kind associated with spinal lesions.

INFECTIVE CEREBRAL DISEASE.

Considerable medico-legal importance must be attached to head injuries, where, as a result of infection conveyed from without, abscess, thrombosis of the sinuses, meningitis, or general inflammation of the brain substance may ensue. Following such paths of infection as the lymph vessels and membranous prolongations which communicate with the various intracranial serous cavities we find that through the introduction of the various cocci, secondary and grave disturbances may be a consequence of trauma. Not only may pyogenic micro-organisms lead to the development of the diseases enumerated, but the tubercle bacillus may find its way into the body or be stirred into activity in subjects in whom it has remained latent or has infected other parts.

CASE XXIII.—The case of a boy about eight years of age who showed brain symptoms eleven days after a fall is reported by Schilling. In this subject fracture of the inner table of the skull with irritation by fragments of bone was supposed to exist, but the patient died before an operation could be performed. After death tuberculous meningitis was found, and it is to be supposed that the encapsulated and latent bacilli were mobilized by the trauma and set free in the circulation at the point of injury (McDill).

As a rule, the infection follows the introduction of material at the point of fracture or site of the external

wound; but occasionally the claim has been made that intracranial inflammation has been due to metastatic extension from a distant point. Under some circumstances this is perfectly possible and probable, but in the case of *McQuade vs. the Metropolitan Street Railway* the patient had sustained a compound fracture of the left forearm which was treated successfully, the wound healing absolutely without any great amount of purulent inflammation. Six months after the accident and after the disappearance of all signs of the fracture the patient developed middle-ear disease, with cerebral abscess, and died. Strange to say, the case had to be tried twice, the jury disagreeing upon both occasions.

ABSCESS OF THE BRAIN

Abscess of the brain, as a result of injury, may be superficial or deep, involving the cortex in the first instance as a consequence of ulceration, and occupying the site between the intramedullary substance and the meninges, or it is more likely to be of deeper origin, invading the white substance, especially of the frontal and parietal lobes. In this respect it differs from that arising from otitis media, which is usually located in the temporo-sphenoidal lobes and cerebellum. Traumatic abscess is acute or chronic, in one case following edema and red softening and developing in from one to two weeks, while the chronic form may be of slow origin and growth, and be associated with an old suppurating wound, from which the infection extends. Thus it may be a consequence of penetrating wounds, or it may occur from pus carried to deeper parts, so that even in some cases injuries of the nose and mouth may, by the conduction of micro-orga

isms through the Eustachian tubes, set up inflammation of the middle ear and establish an abscess in those parts of the brain which are in such close proximity. Such an accident, however, is rare, the purulent collection developing from some local condition, ordinarily without fracture of distal parts. Penetrating wounds of the orbits may be the means of introducing the materies morbi into the subdural and arachnoid extensions which accompany the optic nerve, or the frontal sinus may, under some circumstances, be the starting-point of an abscess or of a serious form of thrombosis elsewhere.

The symptoms of cerebral abscess are exceedingly suggestive, especially the intense headache and the cerebral vomiting—that is to say, vomiting without nausea, which is of a peculiar explosive character, and bears little or no relation to the fulness or emptiness of the stomach. In conjunction there may be convulsions and other evidence of increased cerebral tension, and irritation, which is variable; elevation of temperature and perhaps optic neuritis. In a certain number of chronic cases the symptoms may be mistaken for those of cerebral anemia, and in others a large abscess may exist in the centrum ovale and be tolerated for years without much resulting trouble. Of course no specific diagnostic signs can be invariably relied upon, and in the localization of the accumulation we must be guided by our general knowledge of cerebral topography and pathology.

THROMBOSIS.

Usually, as a result of some injury of the diploë and the introduction of infectious material, there may be an induced thrombosis of the sinuses of variable extent. As

a result, an initial inflammatory action takes place in th wall of the particular sinus, so that it becomes roughene and favors the coagulation of blood. A slow or rap extension is manifested by stasis, coagulation, and occl sion of the vascular canals. Sometimes the initial fact is the occlusion of a vein communicating with a sinus the pressure of a foreign body, or, again, it is made b the products of inflammation. The symptoms of sec ondary thrombosis, which is a traumatic form, as distin guished from that which is dependent upon the previou existence of other diseases, or as a result of chlorosi and anemia, follow fractures, the extension of erysipela from superficial parts, and otitis. With the latter w have nothing to do except when we find that such inflan mation is due to a fracture which involves the tempor bone. This form of thrombosis is a somewhat late bu nevertheless sudden result of infection from a long-exis ing wound, and is symptomatized by rigor, high fever, pr fuse sweating perhaps, and by other evidences of septi infection. There is often a transfer of the septic materi elsewhere, and pulmonary pyemia is the ordinary caus of death. Certain indirect symptoms, which are usuall unilateral and later bilateral, may express the extensio of the disease, and, as Macewen has pointed out, there a variation in the severity of these symptoms: those one side being less pronounced after a time, while th other becomes more markedly affected. Thrombosis the superior longitudinal sinus, which more often f lows injury than elsewhere, is ordinarily accompanied edema of the scalp, distention of the veins of the parie and occipital regions, epistaxis, and perhaps squint, a by convulsions, followed by paralysis. Thrombosis

this situation may also be due to caries consecutive to head injury. The symptoms of deep extension to the cavernous or other sinuses give rise to facial neuralgia, occipital or extending vertebral pain, exophthalmos, edema of the eyelids, ptosis, strabismus, and pupillary changes, which may be unilateral or bilateral.

CEREBRAL MENINGITIS.

(*a*) Pachymeningitis Interna Hæmorrhagica.

The first variety is usually a chronic and slowly developing form of meningitis limited to the dura, or involving the dura and the other membranes, and is characterized by the formation of a blood tumor or *hematoma*. After a blow or other cranial injury a hemorrhage may take place, leading to the growth of richly vascularized connective tissue, with thickening and sanguineous collections, and may be preceded by a slowly developing meningitis. In every case there is a thickening of the dura, with layers of imperfectly organized tissue and evidences of repeated extravasations in different stages of absorption.

In the non-traumatic form there is usually some predisposing cause, and a variety of general diseases enter into its development, among them affections of the heart and kidneys, rheumatism, alcoholism, sunstroke, and some of the infectious fevers. *Traumatic pachymeningitis* may follow almost any kind of a blow, but it usually occurs after an injury of the vertex, which may or may not be connected with fracture. When associated with compound fracture there may be an extradural abscess, and Macewen reports with others the following:

Case XXIV.—A man received an apparently trivial wound on the upper and back part of the head after a fall upon a sharp stone. Although the wound was healed, his immediate condition was not such as to attract attention. About three weeks after the accident, he developed a dull aching pain on the left side of the vertex, which subsequently became acute and lancinating. This was followed by mental depression and a sensation of weight, and by irritability and insomnia, with giddiness upon movement. The pain was referred to the vertex and brow rather than to the cicatrix, which was situated to the left of the median line at the posterior extremity of the parietal bone. That form of tumidity about the cicatrix which is known as Pott's puffy tumor was present, and the diagnosis of suppurative pachymeningitis was made. This was four weeks after the accident. An incision over the cicatrix disclosed a stellate fracture of the skull with slight depression of the external table and much depression and comminution of the internal table. When the broken bone was removed, about four drachms of pus escaped, and it was found that the dura was covered by a thick layer of granulation tissue. The patient made a perfect recovery.

All cases by no means present the favorable prognosis found above, for through neglected or delayed surgical procedure a depressed fracture may give rise to a slow and incurable inflammation of the dura, and of the underlying membranes as well, which in turn may lead to the expression of a large number of slowly appearing symptoms, and a condition which resists both medical and surgical treatment. Chief among these are diffused or localized headache and cortical irritation or pressure symptoms, which bear a close relation to the extent of the thickening. In these chronic cases not only may there be irregular paralysis, but convulsions as well, and a distinct mental change manifested by early irritability, insomnia, restlessness (which is followed by intellectual dulness), and possibly a late dementia. The headache is often in-

Old Head Injury. Softening and loss of left frontal lobe, chronic pachymeningitis, right hemiplegia, aphasia, epilepsy, dementia.

creased by heat or even the slightest indulgence in alcohol. In those cases in which there is suddenly formed hematoma, there may be at the same time a corresponding loss of consciousness, cerebral vomiting, and contraction or dilatation of the pupils, and when the paracentral convolutions are involved, corresponding motor symptoms. In serious and slowly developing cases, as a result of brain atrophy or porencephaly, there are the usual general and hopeless indications of extensive destruction.

(*b*) Leptomeningitis.

Inflammation of the arachnoid and perhaps the pia mater, which is traumatic, is usually infectious, following extension from other parts—the pyogenic process depending upon the passage of infection through the circulation from some focus of inflammation, as a result usually of thrombosis elsewhere. It is often purulent, and may be associated with the formation of abscess, and naturally is extremely obscure in its origin. Attention has already been called to the possible channels of infection by which pyogenic micro-organisms as well as bacilli find comparatively easy access to internal parts from fracture and carious bones, where the local purulent formation originates.

In cases in which erysipelas of the scalp is associated with compound fracture and cerebro-spinal leptomeningitis, it is not uncommon to find streptococci pyogenes; staphylococci, aurei, citrei, and albi in the discharge. By proper cultivation it is possible under some conditions to identify the micro-organisms with those found in the pus of otitis media and other localized collections. As leptomeningitis may also be tuberculous, or follow the exanthemata, the patient's history must be closely scrutinized,

and we must look for special germs of other troubles elsewhere.

Inflammatory conditions, due to fracture of the skull, are more prone to lead to the development of leptomeningitis than are those due to otitis media or other primary affections. The disease usually develops within two weeks, but may be almost immediate, although, like pachymeningitis, it occurs sometimes in connection with a suppurating wound a long time after an injury has been received. Its course is usually rapid, and if at all extensive and active may carry off the patient in less than a month. Beginning with more or less diffused headache, which is usually intense, and by elevation of temperature there is restlessness, as well as rapidity of pulse, muscular twitching and extreme irritability, photophobia, intolerance of noise, and other evidences of excitement. There is at a later time cerebral vomiting, followed within a day or two by general convulsions, exaggerated reflexes, delirium, and pressure symptoms indicated by coma, want of control of the sphincters, and ultimate collapse and death. The whole course of the affection is attended by changes in temperature of a characteristic kind, there being a rapid rise toward the end. Should the inflammation extend to the base, we find cranial-nerve symptoms, and perhaps optic neuritis. In some cases in which the inflammatory process is not so active, especially when the dura is involved as well, there may be a slowly developing and not necessarily fatal form of trouble, the prognosis, so far as the ultimate end is concerned, however, being bad. In others the meningitis is of light grade, and is associated with slow cortical disorganization and an irritative lesion.

CASE XXV.—This is a case, reported elsewhere by the writer, in which a man fell from a fire escape to the ground, two stories below, striking upon his head and left shoulder. He was taken up unconscious, and remained so for fourteen hours. The only apparent injuries he received were two severe scalp wounds, one of which, in its slowness in healing, must have been attended by some bone injury. From this statement it would appear that there were puffy tumors upon the scalp, which were opened with some escape of pus. He was seen by the writer ten years after the accident, when two cicatrices were visible, one one and one-half inches long on the left side of the head, apparently over the superior part of the left parietal bone. There was a distinct point of depression, but only a slight cicatrix visible on the right side, but very superficial. In this case there was no hemiplegia, but three months after the fall the patient noticed tremulousness of the fingers of the right hand, and afterward the arm of the same side with hyperesthesia of the right side of the face. Both the left leg and arm were in no way affected, but the right lower extremity became agitated when he attempted to use it. There was some apparent anesthesia on the right side, but no loss of susceptibility to pain or temperature. When he stood with his eyes closed he swayed somewhat, but did not fall. He was for some time ataxic in walking and suffered at times from pains in the right shoulder and thigh, but there were no other sensory symptoms but those mentioned. This man continued for years in the same condition, changing very little, but gradually becoming intellectually dull and incapacitated for work.

SPECIAL FORMS OF CEREBRO-SPINAL DISEASE SOMETIMES DUE TO INJURY.

Several general diseases of the nervous system have been said to owe their origin to trauma, although about some of them there is much contention. Undoubtedly, under certain circumstances, as a result of head injury, we sometimes encounter a slowly developing sclerosis of brain and cord, which has been called *multiple cerebro-spinal sclerosis* or *sclèrose en plaques*. In the early stages

it is sometimes confused with neurasthenia, but when established there is no reason for such a mistake, for there is a close correspondence between the manifestation of the train of serious and well-defined symptoms and the formation of numerous and widely distributed foci of disease, which consist in an increase of neuroglia and induration in limited spots ("islets") in the brain, medulla, cerebellum, and spinal cord, giving rise to weakness and a peculiar intention tremor as well as a great deal of awkwardness and stiffness when certain muscular acts are attempted. There are an increased activity of the reflexes, sometimes nystagmus, and often optic-nerve atrophy. The speech is peculiar, and becomes scanning or "shivering" in character. There are vesical troubles, such as are found in other forms of sclerosis, ataxia, and bulbar symptoms if the medulla and great basal ganglia be involved, and sensation is usually unaffected. The disease is progressive and incurable. Its course is exceedingly irregular, and there is great room for mistaken diagnosis. Sometimes it is confused with dementia paralytica or general paresis, but the ocular changes and the mental symptom of the latter will serve to make the diagnosis clear. In the beginning it may be mistaken for traumatic hysteria, but the tremor of the latter is truly not volitional, and in hysteria there is never oscillation of the eyeballs. It is usually a sequel of certain infectious fevers and depraved states, and rarely an accident disease, and when it occurs is consecutive to some grave injury.

PARALYSIS AGITANS

There may be a traumatic form of this disease, and cases exist in which blows upon the head have preceded its

development. In one with which the writer is familiar, it followed a trivial injury to the ulnar nerve, which in turn became the basis of an hysteroid condition characterized by inaction and fear of movement. It would seem almost as if, when the injury was cranial or directed to some other part of the body, that a peculiar mental state was induced, characterized by more or less inhibition of movement, and after the establishment of this appeared the peculiar tremor which is so well known. I have seen but one case which formed the subject of litigation, in a man of middle age, and here the tremor had undoubtedly begun several years before the alleged accident. The symptoms consist of a comparatively fine tremor, participated in by the forefinger and thumb, and afterward by the rest of the fingers and the muscles of the entire hand, the right side being the favorite seat of invasion. This may, after a period of months or years, involve the entire upper extremity, and usually the lower extremity of the same side next, and finally the whole body. Attempts at the beginning are made to control the tremor by the patient, who presses the ball of the thumb against the tip of the forefinger or some small object; but this relief becomes ineffectual after a while. The muscles of the face are rarely involved, but the voice becomes low, harsh, and rasping, and articulation grows difficult, being interfered with by the accumulation of saliva in the mouth. The patient when attempting to rise from a chair to walk, does so with difficulty, being propelled forward in a disorderly way, so that what is known as *festination* results. He usually sits or walks with the body bowed, the chin thrust forward, and the knees slightly bent. His face is expressionless, and the whole

appearance and attitude are striking. Insomnia, by reason of the inability to find a comfortable position in bed, and severe pains of the joints, which follow, are later features of this distressing affection. Its progress is uninterrupted and slowly enfeebling, and death may occur after many years with little or no mental impairment.

EPILEPSY.

The frequency of head injury as a cause of epilepsy was emphasized by many of the older writers, but there has been a reaction since neurophysiology and chemistry have thrown so much light upon the pathology of the affection, and have shown that so many conditions have to do with its genesis. The fit itself may be said to be symptomatic of an altered state of cell equilibrium from whatever cause, and usually proceeds from some disturbance of local metabolism. The experiments of Mott have shown that the epileptic explosions of dementia paralytica are attended by an increase in the accumulation of cholin in the blood and cerebro-spinal fluid, as a result of tissue destruction, and doubtless the ordinary epileptic fit ha some such explanation, especially when there is a morbi process, which may or not follow a trauma and resultin contusion or laceration.

The surgical features of epilepsy that deserve consi eration are: 1. The influence of depressed bone or t products of inflammation in producing cortical irritatio 2. The existence of cicatrices. 3. The possible prod tion of the disease through the crushing or injury of p ipheral nerves. 4. The effect of violence to the h without external wound or fracture.

That an epileptoid neurosis may follow injury to the

head without any appreciable wound or other evidence of violence cannot be doubted; but this sequel of trauma need not necessarily be serious. A form of congestive disorder described by Andral and the older writers, and later by W. A. Hammond, may closely simulate epilepsy and is curable. A more grave disease is that dependent upon contusion of the brain, of the form described by Vibert.

Nothing more need be added as to the influence of irritative and destructive lesion of the cortex in the production of that localizable affection known as Jacksonian or cortical epilepsy. What has been said of the awakening of dormant disease may be recalled, and sight must not be lost of the fact that syphilitic and other growths may be responsible for the paroxysms, the trauma being an exciting factor, and that some of these, especially the former, are amenable to treatment.

In a number of recorded cases the presence of a cicatrix has been discovered. While on the one hand its site may be that of an underlying fracture, on the other there may be nothing of the kind, and the dense tissue may be the starting-point of an irritation that gives rise to fits when scalp pressure is made. Féré reports the case of a man of thirty-six who received a fracture of the skull in November, 1870, but which healed in a few weeks. Six months later he developed epilepsy of an irregular character, and had as many as five or six attacks in a day as a result of indulgence in absinthe. In the median part of the frontal region there was an irregular cicatrix about eight centimetres long, extending from left to right, and so extremely sensitive that simply shaking the hair in its vicinity pro-

duced great pain. It was impossible to make an exploration, for pressure was followed either by an attack or by vertigo and pallor. At various times there had been some exfoliation of bony splinters. The cicatrix did not correspond to the region of the motor centres, and the attacks were not considered to be Jacksonian. As a rule, they were preceded from twelve to forty-eight hours by a pain first confined to the cicatrix, but afterward extending to the entire convexity of the skull, and then without warning the patient would fall suddenly after crying aloud, the limbs being extended. This was succeeded by clonic movements, mainly on the right side, and by a condition of stupor; a slight degree of right hemiparesis was found after recovery. The patient was cured by the trephine, a button of bone being removed which was about one and one-half centimetres in front of the bregma, and no evidence of disease of the dura beneath was found. It has been held that where there no external appearance to enable one to localize the traumatic lesion, if there be pain on the side opposite to the localized spasms and some loss of power on the side the body in which the spasms appear, the inference of injury of the cortical motor centres may be drawn.

In certain diseased conditions of the middle ear called reflex epilepsies sometimes follow the merest contact or the blowing of air into the external meatus, or even a slight exhibition of force.'

While the claims of Brown-Séquard are often open to doubt so far as their confirmation by clinical facts concerned, there can be no doubt that he was able to produce convulsions in animals, particularly guinea-pigs, by crushing the sciatic nerve. But such injury to the human

subject has not hitherto given rise to classical epilepsy, although the claim has been made as the basis for compensation. A case in which a great deal of nerve injury in connection with an unskilful amputation was supposed to cause the epilepsy, which followed later, came under my observation, and a second operation was ordered for the purpose of removing the degenerated nerve ends, but without result.

CASE XXVI.—J. M——, aged 25, was a salesman in a large department store, of good habits, who never had had any head or other injury until November 29th, 1889, when he was run over by a railroad train, losing his right leg and receiving a blow upon the left side of his head. He was about three months in the hospital, where his leg was amputated, and he recovered fully with the exception of neuromata, which involved the ends of the severed nerves and which were exceedingly painful. In August, 1894, upon a very hot day, at about 11 P.M., he had a severe epileptic convulsion preceded by a shriek, and in this he bit his tongue and foamed at the mouth. The convulsion began on the right side of the body, and was followed by a disturbance of speech for several weeks, which was solely due to the wound of the tongue, and not to ataxic aphasia. He had attacks of temporary blindness and petit mal several times during the day. He had another attack a few months later, the right side being again affected with residual pains, some of which were due to the dislocation of the right shoulder. He had paroxysms regularly after this, the right side being always involved, and upon one occasion the mouth seemed to be drawn to this side. They were both nocturnal and diurnal, and from 1898 until I saw him a year later he had had light paroxysms without auræ. He suffered constantly from headache on both sides of the vertex, his sense of smell being decidedly impaired on the right side, and he evidently suffered a certain amount of mental weakness. As his stump was painful, and the result of the first surgical operation was exceedingly imperfect, I sent him to the New York Hospital, where a fresh amputation was performed, the result being a great improvement in his local condition; and as a large neuroma was removed, it seemed possible that

there might be some improvement, but after two months the attacks returned with greater frequency. There was no depression or external evidence of fracture of the cranium, and it was deemed best not to attempt any further surgical interference, although there was little doubt in the minds of those who saw him that he had an obscure focal lesion of the cortex, and possibly some injury of the base, which accounted for the anosmia. The peripheral nerve degeneration in the amputated extremity was thought at first to be the starting-point of the paroxysms in a manner suggested by Brown-Séquard.

CHAPTER IV.

TRAUMATIC INSANITY.

IN preceding chapters the mental alterations consecutive to injury or shock have been considered, so that any detailed description of traumatic functional disturbances may be here dispensed with. Meyer, whose recent consideration of the subject is comprehensive,[1] refers to the rather general disposition to misuse the term traumatic insanity. "Some writers," says he, "include — bowing

[1] MEYER'S CLASSIFICATION.

1. *The direct post-traumatic deliria with the following subdivisions.*
   - (*a*) Pre-eminently febrile reactions.
   - (*b*) The *delirium nervosum* of Dupuytren, not differing from deliria after operations, injuries, etc.
   - (*c*) The delirium of slow evolution of coma, with or without alcoholic basis.
   - (*d*) Forms of protracted deliria, usually with numerous fabulations, with or without senile basis.
2. *The post-traumatic constitution.*
   - (*a*) Types with mere facilitation of reaction to alcohol, grippe, etc.
   - (*b*) Types with vasomotor neurosis.
   - (*c*) Types with explosion diathesis.
   - (*d*) Types with hysteroid or epileptoid episodes, with or without convulsions (such as most reflex psychoses).
   - (*e*) Types of paranoiac development.
3. *The traumatic defect conditions.*
   - (*a*) Primary defects allied to aphasia.
   - (*b*) Secondary deterioration in connection with epilepsy.
   - (*c*) Terminal deterioration, due to progressive alteration of the primarily injured parts, with or without arteriosclerosis.
4. *Psychoses in which trauma is merely a contributing factor.*
   - (*a*) General paralysis, with or without traumatic stigmata.
   - (*b*) Manic-depressive and other transitory psychoses; katatonic deterioration and paranoiac conditions, with or without traumatic stigmata.
5. *Traumatic psychoses from injury not directly affecting the head.*

to the crude sense of the word — all mental disorders in whose etiological constellation any traumatism plays a rôle; even a surgical operation, or a totally indifferent organ, or a fracture of an ankle . . . also insolation is frequently included."

Although it is popularly supposed that head injuries are the most fruitful causes of insanity, statistics do not appear to prove this to be the truth; for at the large Scotch asylum under Clouston's care there were but twelve cases directly due to these and to sunstroke, or one-third of one per cent of all the admissions during nine years.[1] Yet many irregular psychoses are undoubtedly traumatic.

Two general forms of traumatic insanity are recognized, viz.: 1. That which includes the cases due direct cerebral injury and expressed by slowly developing motor symptoms, amyosthenia, varying degrees of hemiplegia, and perhaps tremor, as well as convulsions, and by vertigo and headache, while the changes in mental health consist of excitement or depression followed by dementia, and occasionally by confusion, with hallucinations and delusions. These patients often give way to impulses of a destructive or homicidal character and are hard to restrain. The organic features of the disease sometimes suggest general paresis and lead to mistakes in diagnosis, especially if there happens to be one or more epileptoid paroxysms. 2. The second form is supposed to be due to shock

[1] The influence of head injury, however, as a factor of recurrent insanity is made much of by Bevan Lewis, who says that twenty per cent of the male recurrent cases at West Riding Asylum had suffered from falls or a violent blow causing temporary unconsciousness without fracture or depression of bone, but at the same time there was a history of alcoholism and criminal tendencies. It is not stated, however, whether these injuries preceded or were inflicted after the development of the mental symptoms.

alone, and where there is no adequate history of any damage to the cerebral tissue or resulting coarse disease.

In a small number of traumatic cases, with associated minute and general lesions, symptoms of cortical disease, due to nutritive changes, are found with or without fracture, and may be exceedingly complex. What almost amounts to a characteristic of this form of insanity is the intolerance of stimulants, or the susceptibility to mental disturbance under the influence of a trauma in persons who are addicted to alcohol.

CASE XXVII.—A boy, aged 16, who was seen in October, 1903, had about nine years previously fallen through a trap door, striking his head upon the vertex on the right side near the median line, sustaining a depressed and comminuted fracture of the left parietal bone. The subsequent unconsciousness lasted five days, and he was taken to St. Vincent's Hospital, where he remained for six weeks. There were immediate hemorrhage from the nose and right ear and internal strabismus for three weeks. There was no paralysis or anesthesia.

A diagnosis of fracture of the vault, with comminuted fracture of the bone, was made by Dr. J. D. Bryant. There was some frontal headache, but the history of other succeeding symptoms was unobtainable. He presented a depression of the scalp and skull about one and one-half inches long and about one-half inch wide, behind the situation of the central fissure, and local pressure produced no pain or discomfort. The right pupil was slightly larger than the left, but both reacted to bright light and efforts of accommodation. There was commencing choked disc in both eyes, but no oculomotor symptoms. The knee-jerks, especially the left, were exaggerated, and there was left ankle clonus, but no apparent loss of power. The innervation of the left side of the face was defective, the tongue being protruded in a straight line, and he occasionally had vertigo. There was a mitral regurgitant murmur. Coincident with the injury he began to drink immoderately, and has continued to do so, although he has gotten into all kinds of trouble, having been arrested for an apparently purposeless and violent assault upon a woman. He has had at least two epileptoid attacks,

and an attack of post-epileptoid violence, in which he assaulted a relative who was with him, but had no memory of this afterward, nor did he recall his last escapade. He has always been neurotic, wilful, and hard to manage. When a child he had chorea. His present mental degeneration is closely connected with the trauma; and although he is bright in many ways, he has degenerated and undergone a change in disposition and morals, which has advanced rapidly.

Shock may either through its purely psychical manifestation or through a general concussion of the cephalic mass induce a notable alteration in mental health. Where no structural disturbance follows—that is to say, where there are no minute anatomical changes—the subject's conduct may suffer material change in certain cases as a variety of altered intellectual function or derangement is almost immediate, or may follow within a few weeks or months after the accident.

What has been termed primary traumatic insanity by Guder, Bailey, and Meyer begins often in this way, and may or not be inaugurated by a rise of temperature, somnolence, and delirium; and is symptomatized by mental haziness, "variable contradictory statements of time, poor calculation, amnesia, and fabrication" (Meyer)—in fact, by a general psychasthenia.

Sudden and apparently complete losses of memory are the familiar and dramatic consequences, sometimes of shock; but they are exceedingly rare, and are so striking when they do occur as profoundly to impress the layman as well as the doctor. They may at times blot out the patient's recollection of his accident, and although the disposition of malingerers is often to pretend not to know what has happened, thus saving themselves a great deal of trouble and impressing the jury, such simulation is more

common in criminal cases in which the hope is to escape the consequences of an illegal act than in those under consideration. It has been alleged that a blow upon the head may suddenly destroy all recollection of past events, and that another head injury at some subsequent time may lift the veil and restore the ability to recall the past; but these examples are rather curiosities of medical literature and rank with those of mental duality, which are usually hysterical conditions, occurring in psychopathic subjects.

A loss of memory usually follows a serious accident and is a part of a general disturbance and structural change in connection with a local laceration, or perhaps fracture.

CASE XXVIII.—A case of this kind was that of an elderly man who had fallen down the stairs of an elevated railroad station, striking the back of his head and sustaining a probable fracture of the skull, an injury of the right arm, and an inguinal hernia. There was evident injury of the cerebellum as well as other parts of the brain, for there was prompt rise of temperature to 102°–103° F., as well as delirium, convulsions, vomiting, headache, and a tendency to pitch to the left. On one occasion he pitched forward from a chair in the doctor's office in which he was sitting, and when walking there was often a tendency to proceed to the left. The head symptoms subsided with the exception of occasional giddiness and procursive movements, although two years afterward there was some tenderness over the left suboccipital region. A feature of this case was a loss of memory for most things occurring after the accident, but with a fair retention of events preceding his fall. In fact his only account of the accident was that communicated to him by others, and there was a coincident weakness; for although he had been up to the time of his fall an intelligent business man, he could not in his altered condition compute simple sums of interest, and was in every way intellectually feeble. In this case, which was tried three times, it was alleged that his symptoms were due to old Bright's disease, the basis for this defence being a transient albuminuria; but several carefully made subse-

quent examinations showed not only no evidences of renal disease whatever, but his arteries had not degenerated, and there were no signs of senility, although he was over seventy years of age.

Concussion either with or without loss of consciousness may give rise to a loss of memory, which at first is so slight as to be little more than confusion, or of a puzzling effort to recall, and there is a weakness interfering with reminiscent ability, the impression made by recent events being decidedly feeble. From this the patient may entirely recover in a short time, or there may be subsequent fatuous condition expressed by delusions of identity and place and so great a degree of mental deterioration as to suggest the beginning of organic dementia. In a small number of persons who have sustained shock there is remaining mental confusion, which may be active or resemble the incoherence of acute mania; or a dazed and bewildered state, which is different from that of acute dementia. Fleeting delusions, both systematized and unsystematized, hallucinations, and great restlessness are found, the confusion being sometimes confined to a species of aggravating indecision, not rising to the dignity of a psychosis.

In such patients there are a lack of concentration and decidedly impaired power of attention, which make their mental state quite evident to the most casual observer. From time to time the newspapers contain accounts of men who have wandered from home and who, when found, have no remembrance of where they have been or what they have done. The mental condition of these patients, as a rule, is supposed to be post-epileptic, or due to a so-called "psychical equivalent" for a convulsion, but this is by no means always true. The writer has known of a

TRAUMATIC INSANITY IN PREDISPOSED SUBJECTS.

There is no form of insanity that at times has not been ascribed to accident; but, as has been said, the statistics show that there is exaggeration in this assumption. Of course, while injury, especially of the head, is a prolific cause of mental disease in persons so predisposed, or as the result of intracranial disease following blows, great care must be taken to determine the connection between cause and effect, and to ascertain whether the mental symptoms did not actually precede the alleged traumatism. There can be no dispute about the fact that occasionally long-continued worry, suffering, or severe shock may in persons with hereditary tendencies lead to the development of a psychosis of more or less gravity when the trauma may be the least part.

Some unstable subjects succumb very rapidly to depressing causes, which would have no effect upon the normal man or woman; and an insignificant injury with its attendant shock would favor a psychopathic decline or breakdown, as would overstudy, worry, or some other like cause.

In these cases it is quite probable that there has been a preceding attack of insanity, or something very like it, and if the facilities are offered we may discover that some of the family of the patient have been or are insane, or that there is a remote history of alcoholism, tuberculosis, epilepsy, or hysteria. While Rigal and other French writers entertain the most catholic views in regard to the production of mental disease by trauma, it is probable that they exaggerate the cause and minimize the psych

pathic basis. Trauma in predisposed cases may be followed by periodic insanity, melancholia, as a rule, being a primary phase, and in several of these seen by the writer the psychosis originated in a previous state of ill health, due to brooding. A limited delusional form, which, however, is not a true paranoia, because of the confusion and decided mental weakness, is occasionally seen; but it is difficult to compare it with either the hallucinatory or simple delusional form so well known.

CASE XXIX.—Upon the 8th of February, 1883, the writer examined J. H. M——, aged 49 years, in company with Dr. A. B. Ball. M—— was injured in a collision between two ferryboats about a year before, the only objective feature being a fracture of a fibula. He had received also a blow upon the head. There were, at the time, a great deal of cerebral disturbance, irritability, and a change in disposition, which became so marked that he was sent by his physicians in Jersey City to an asylum, because he was dangerous and threatened his family. He was a large and active man, restless and unstable, and lacked fixed attention and insight. His eyes were bright and wandered restlessly, and he looked away from his questioners when replying; his pupils were dilated and his manner was excited. He did not finish answers, constantly turning into new channels. He said that he had had personal communication with God, and dreamed at other times. When asked if he saw God only in his dreams, replied: "No. He has appeared to me in person, and I saw His clothes and beard." He said that he was an agent of the Almighty, and was to compel persons to do as he told them; that his wife and children were unkind and did not care for him, that they would be better out of the way, etc. He could assign no reason for their ill-treatment except that one of his children, whom he "hated the most," had injured one of his saws; and admitted that he had told his wife he would cut her throat and his own. He had expressed delusions of importance and wealth. He denied insanity. On some subjects he could talk clearly enough, but close questioning showed that his mind was weak, and this was manifested by some more or less confusion and instability. There were no physical symptoms

whatever. It was ascertained that there was an unsound fami history, and he had always been peculiar. His case came to tri before his mental condition was fully recognized. On the witne stand he abused his counsel, and said he did not need damages compensation. In this case the right of a lunatic to bring a su was questioned, but was decided after appeal in the affirmativ There was a subsequent compromise.

CASE XXX.—Another case, the subject being the daught of neurotic parents, was seen by the writer in December, 190 She was a passenger on a train wrecked at Paterson on Novemb 29th, 1899. Although occupying a seat in the drawing-room c which was one of those that escaped, she was considera stunned and shaken up by the collision, but sustained no wou and on leaving the car was obliged to pass through a place wh there were a number of mangled bodies and wounded pe The immediate effects of this shock were very severe, and reaching home she was utterly demoralized, apprehensive, a constantly referred to the accident. She became nervous a timid, grew thin as she would not eat, and lost much sleep; sile and introspection followed, and it was with difficulty that any o could get an answer from her. On December 20th she told h mother that her being on the train was a "put-up job"; that t accident happened because *she* was on it. Because of the increa of her ill health she was advised to consult Dr. McEvoy, one c the physicians at the Vanderbilt Clinic, and went there severa times, but suddenly left because she thought that everybody wa watching her and "saying things against her"; that "the docto had put poison in her medicine, and blown something into he nose of a poisonous nature." Her excitement increased so that i was found necessary to watch her continually. On the 6th c 7th of April, 1900, she went to the house of her betrothed, whom she accused of poisoning her, and a few days later was seen by th writer, when she manifested well-recognized delusions and hall cinations, believing that there was a conspiracy against her; th she was unfit to be in the society of decent people; that she e haled a peculiar and subtle odor, her father, mother, and you man to whom she was engaged having conspired to poison h and said that they had put something upon her clothing; that s had changed her waist three times in one day, and the bedcloth

so that they would not be contaminated. The coffee they gave her had also been doctored by some one. She believed herself to be absolutely immoral, and said that when she went to the dispensary people were trying to make improper proposals to her, and looked at her in a peculiar way.

She thought that others in the street cars also had evil intentions. At other times she was excited and anxious, and declared she was about to die. Her delusion of self-degradation was such that she would not go to church because she imagined the clergyman was preaching at her, and because the people looked at her and knew her wickedness. She was a strong and well girl before her accident, was sensible, calm, and quiet, and her bodily functions were in normal condition. Since then her menstruation had been irregular, and she would go seven weeks at a time without any period. Although her active delusions subsequently disappeared, she was different in many ways, and lost all her former brightness, and was dull and moody, and had delusive ideas. Though the case was settled for a comparatively small sum she has not recovered, there being an undoubted permanent condition of impairment.

While it is held and it is undoubtedly true that a serious *hypochondriacal melancholia* may follow a railroad injury and be manifested by an initial condition of neurasthenia, ordinary hypochondriasis, and simple depression, the evolution of such a psychosis and the patient's complaints bear a direct relation to the accident itself—at least in the beginning, and there is more or less reference to the excitement through which he has passed, and the specific incidents which have to do with his morbid fears. When we meet with an alleged delusional hypochondriasis where these things are absent, it usually has some other explanation. Such a case was that of Mr. S——, who brought suit for damages upon two occasions, and whose friends and physician ascribed his evident insanity to trauma.

CASE XXXI.—Mr. S——, clerk, about 45 years, claimed to have been injured by being thrown to the ground by a street-railway car on the night of June 26th, 1898. The plaintiff is a Hebrew, and according to his friends had enjoyed good health before the accident. It is certain, however, that several years before, he had consulted several specialists abroad, who were authorities on venereal diseases, for real or fancied syphilis. He admitted this to the writer, and there was no reason to doubt the fact; besides there was a suspicious discoloration upon one shin, agreed by one of his physicians to be possibly syphilitic. Before June, 1898, his brother-in-law, who had had syphilis, was sent to an asylum, and there died of paretic dementia. This had a most depressing effect upon him, and he not only dwelt much upon the subject, but bought medical books and read a great deal. Knowledge of his own history led him to believe that he too might become insane, and he grew intensely hypochondriacal, and probably was in this condition at the time of the accident. According to the evidence he was picked up and taken to the house of a neighboring doctor. This gentleman found no cuts or bruises. The patient talked rationally, and said "nothing was the matter." He went home, and, according to his family and the two physicians who attended him, became insane, although it was not found necessary to send him to an asylum. According to them, during the summer of 1898 he had lively delusions of persecution, believing he was responsible for the death of a well-known musician, as well as that of the Empress of Austria; that he was concerned in the blowing up of the battleship *Maine*, and was constantly pursued by detectives. He actually delivered himself up at a police station, confessing that he had done all these things. He referred to a conspiracy that was being formed, of which he was the victim, and said that he had been hypnotized; but his delusions were all connected or evolved from his early sense of degradation and contamination.

When I saw him, a year before the first trial, which occurred in May, 1900, he was free from his false beliefs, and admitted that they were delusions. He then told me that he had all the time dreaded syphilis, and spoke of his anxiety regarding the case of his brother-in-law. He also communicated to me his history of headaches and insomnia, and at the time his mental condition was one rather of dulness than excitement. He never worried about

the accident, but had frequently referred to his dread of insanity. During the summer of 1898 he went to his business unattended, and to his doctor's office, and backward and forward to the country alone during the summer, and up to January 16th, 1899. He talked about his children intelligently, and played games with his business associates during the time he was alleged to be incoherent, and to them appeared to be only dull. To various persons he complained prior to the trial of the case that he had syphilis. He was not so possessed by the alleged delusions that were claimed to be unsystematized and engrossing, that he could not talk about his early life to his wife, and show some interest in his affairs. The case resulted in a verdict for the defendants, it being proved that they were not responsible; and it was also claimed that his psychosis was not due to the alleged accident, but was a species of syphilophobia that originated before and was curable. In 1902 it was admitted that he had recovered, but a second trial resulted in a disagreement. His mental state certainly bore no resemblance to any classical insanity; certainly it was not a genuine paranoia, but it is not difficult to diagnose a hypochondriacal melancholia based upon the knowledge of the existence of a loathsome disease, with constant introspection, a sense of degradation, and delusions of self-abasement and culpability, which subsequently expanded into those of suspicion.

Acute dementia or *hebephrenia*,[1] which is usually an insanity of early life, occurs in subjects who present the tendency to the degenerative psychoses, and shock is commonly an exciting cause. It is characterized by rapidly developing confusion and stupor, which resemble the lethargy of stuporous melancholia, and is not the form in which delusions or hallucinations figure. There is, however, not the progressive mental decline of melancholia, but a sudden development which, under other circumstances, is due to some such cause as the ingestion of an unusual amount of alcohol, overexhaustion of the brain

[1] Or a form of the dementia præcox of Pick.

from overstudy, but in the cases under consideration may follow the shock incident to a railway or other accident. The condition of the cerebral circulation is undoubtedly one of profound anemia, and in this respect it resembles ordinary melancholia. The dulness of the patient is apt to be very great, and his attitude and whole appearance is impressive and not to be mistaken. The surface and extremities especially are cold and livid. He makes little or no voluntary movement, is indifferent to external irritation, and may be so dull as not to notice the crawling of flies over the surface of the body. It is usually necessary to feed such a patient artificially, as he makes no volitional effort to swallow. He is always listless, leading a vegetative life and appearing mentally much worse than he really is, for there may be recovery in a comparatively short space of time. His mental instability, however, renders him liable to other attacks, which may later have nothing to do with the accident. Sometimes a *katatonic* state, with muscular waxy rigidity, may be presented.

Apathetic conditions having an hysterical tinge are after trauma found in elderly people, and with these there may be an associated childish obstinacy and weak aggressiveness manifested in assaults, destruction of clothes, and defilement of person and bedclothing, the patient seemingly being actuated by the idea of giving the attendant as much trouble as possible. The effect of an actual trauma upon an elderly patient whose blood-vessels are diseased may be such as to favor the development of senile dementia, and the mental evidences of a general arteriosclerosis, which before the accident were not such as to attract the attention of the friends of the patient

may become noticeable when others incident to fright or shock are added.

CASE XXXII.—Mrs. M——, an aged woman, was thrown to the ground on July 16th, 1899, by a street car, which, it is alleged, started when she was boarding it. She claims to have received a scalp wound, but nothing else; but it is alleged by her family that she gradually became insane, and was committed to a sanitarium in August, 1899, where she stayed for eight weeks.

During this time it was said that she suffered from insomnia, fits of despondency, restlessness, inability to recognize those she knew, and disorientation; that she made attempts at suicide, accused those about her of robbing and poisoning her, had visual hallucinations, stating that she had seen her father and mother, who were long since dead, and believed her daughter was married to a priest. The patient was seen by the writer March 10th, 1900, and her history was detailed by Dr. C. J. McGuire, who stated that in addition to the above she had delusions of suspicion, fearing that she was to be locked up by persons who wanted to get her money; that she had a dread of poverty; that her memory was poor; and that she was not able to go out alone. My examination lasted nearly an hour, and there was no mental weakness shown except such as one might expect in a person of her extreme age, for she was nearly eighty.

Besides the weakness of memory for proper names and of recent events, there was no disorderly behavior or mental aberration, at least then. Her chief complaint was that her son had been charged a large sum by the officials of the asylum for care and treatment, and for this reason she wanted to leave.

Her former excited condition in the absence of other facts must be attributed to the mental shock, and as the weather was very warm at the time, there is little doubt that the general excitement precipitated her trouble, which in a person of her age was natural enough. She showed evidence of senile degeneration, her arteries everywhere being rigid.

PARETIC DEMENTIA (DEMENTIA PARALYTICA

Injury is by many admitted to be one of the caus of this familiary mental disease, although syphilis ranl first. According to Defendorf, a clear history of its sp cific origin cannot be obtained in more than thirty-fo per cent of the cases, though other writers fix the propc tion at a much higher figure. At a time not so long ag syphilis and alcohol were by the Germans especially he to be the sole etiological factors; but a reaction h taken place, for strain, excitement, and protracted wor figure in the genesis of paresis, and doubtless traur acts, as it so often does in locomotor ataxia, by devel ing a parasyphilis, so the necessity of obtaining a relia history of early infection is paramount. It is importa to remember that the prodromal stage of the disease one in which there is often a long-existing stage of brea down with expressions that are not clearly evident t most people. These consist for the most part in change of disposition and habits, and a general condition of mor or less mental weakness, which has already been referre to when speaking of neurasthenia. To these are adde such physical symptoms as tremors of the lips, tongue and hand, awkwardness of speech and a certain shive ing articulation, inequality of the pupils, and perhaps th Argyll-Robertson symptom. The knee-jerks in a certai number of cases are lost, and there is some deterior tion in handwriting. At such a time the receipt of a injury to the head may at once lead to the developmer of an acute condition of mental disturbance, an explosio of violence, or a rapidly developing dementia, and this naturally ascribed to the accident alone. It may not b

difficult to ascertain, however, that at some previous time the patient has been melancholic, hypochondriacal, perhaps morbidly elated, or that some of the physical stigmata have been present; in other words, that the prodromal stage has existed for a considerable period.

Head injury is far more likely to produce one of the forms of organic dementia than the more or less definite psychosis known as paretic dementia, and even the most pessimistic statisticians rarely go beyond eight per cent as their estimate of the proportion of purely traumatic cases, and this rather overstates the percentage. The incipient paretic is apt to get into trouble because of his mental peculiarities, or to fall as the result of his vertigo or unconsciousness, and this is still more likely if there be an epileptoid explosion, which is so often apt to be the case in the early stage of the disease. He may thus sustain a head injury, which is ascribed as the cause of the subsequent accentuated disorder. I have noticed in the prodromal stage, when the patient is superficially emotional, he is likely to become pliable under the influence of suggestion, and through the machinations of dishonest plotters may misrepresent his real condition or else allow others to do pretty much as they please. A case of Le Grand du Saulle, previously reported by the writer, is that of two brothers who consulted a Parisian psychiatrist of note, who made a diagnosis in one of paretic dementia. The other took the patient to an insurance examiner, who promptly recommended a policy, apparently not noticing the existence of the disease. When the man died two years later, the money was paid without protest. It is quite probable in this case, as in many others, that the paresis developed from a light

form of syphilis, with slight primary lesion, and that no stigmata were found.

Paretic dementia, beginning with an initial stage of depression or exaltation, develops quite rapidly, although its course may extend over a number of years. The idea formerly entertained that the disease ends in eighteen months or two years seems to be erroneous, for subjects are found in every asylum in whom it has lasted for ten or fifteen years. There is much uncertainty in its début, the physical preceding the mental symptoms, or *vice versa*, but usually we find them coincident in the fully developed disease. There are commonly a decided change in the morals of the patient, especially so far as sexual excesses are concerned, and a great deal of optimism, which is succeeded by expansive and preposterous delusions of importance. In the beginning he may be prodigal in his expenditure of money as the result of these, and there seems to be no correspondence between their expression in people of different classes of life. The feeling of *bien être* brings with it a sense of happiness and jollity. He orders innumerable things which are not paid for, and when arrested or confronted by those he has robbed or imposed upon makes an insane explanation, which is perfectly satisfactory to himself if not to others. He constantly plans, no scheme being too extravagant for

FIG. 19.—Facies of Paretic Dementia.

him to adopt. At times he is violent, especially when interfered with, and as the result of his delusions may even become destructive; but, unlike the paranoiac, he can be diverted or led, or a new idea may be suggested and readily adopted. Hallucination and incoherence, and delusions of persecution are sometimes present. After a variable period, during which there may be remissions, when the patient to many people is apparently well, there may be a relapse; but there are rarely more than two or three such intervals, although certain writers describe an alternating or recurrent form. Ultimately the mental weakness grows more marked and dementia ensues. The physical symptoms are always present when they have once appeared, although there is some variation, especially in the char-

FIG. 20.—Final Helpless Stage with Contractures in Paretic Dementia.

acter of the dilatation of the pupil, and in addition to those of the prodromal stage there is a disturbance of locomotion characterized by unsteadiness and titubation. The facial muscles are tremulous and the speech is more embarrassed. The reflexes may later be exaggerated, especially in the cerebro-spinal form of the disease.

There is a great emotional instability as well as a tendency to cry, this even occurring without any apparent provocation. Finally the dementia and physical weakness are so marked that the patient cannot stand, and he takes to his bed, where he remains for the brief remainder of his life. Progressive dissolution is marked by muscular asthenia, atrophy, and permanent contractures (Fig. 20), by incontinence of urine and feces, by the formation of bedsores, and by general helplessness and death.

CHAPTER V.

INJURIES OF THE VERTEBRAL COLUMN AND ITS CONTENTS.

NATURE has provided a most ingenious and well-protected conduit for the complex and important bundle of nerve fibres which play so large a part in the human economy. Enclosed in a bony canal, which is made up of segments ingeniously supported and linked together by ligaments and capsules, and separated by buffers of cartilage, which take up the force of too violent concussion, it is in a position to do its work of carrying impressions and impulses from without and within and performing its local duties. As if these safeguards were not enough, we find the cord surrounded by membranes, cushioned by cerebro-spinal fluid, and in a measure supported by the nerve trunks. In view of all this, concussion is not the common thing it is supposed to be, and if it does occur, it is, as a rule, evanescent and expressed by short-lived symptoms, such as fleeting disturbances of sensation and a certain degree of motor weakness. Injuries which lead to fracture or dislocation of the vertebræ under certain circumstances, however, set up inflammation in the intervertebral cartilages, and may give rise to a number of serious structural diseases of the cord itself, which are immediate or slow. Thickening of the investing membrane and compression myelitis, especially in the cervical region; injury of the important nerves of the

neck; hemorrhages within or between the membranes, in the substance of the spinal cord, with resulting comp cations, are all grave, and are apt to follow the exhibiti of sufficient violence. Of lesser importance, but of co moner occurrence, are a number of painful and obstina injuries, which are, however, exterior to the vertebral c umn, and these may consist of contusion or stretching the spinal nerve trunks, a possible separation of the atta ments of the muscles of the back, so that muscle fib may be ruptured as well as tendons, or bony eminen may be torn away. There are few cases of severe r road injury in which sprain is not found with or with neurasthenic symptoms, and Dana goes so far as to s that traumatic neurasthenia is nothing but ordinary ne asthenia with added sprain, so important does he consid this result of the ordinary expenditure of violence to b Sprain is mentioned in most of the treatises as a co stant symptom of traumatic neurasthenia, which, howeve it is not. It is hardly necessary to say that its exte depends upon the nature of the wrench, which may va from a trivial affair with a localized area of back pain, a forcible twisting of the entire vertebral column, wi more or less torsion of the cord itself, when of necessi we shall have spinal symptoms of varying importan and duration, and possibly contusion of the nervous ma ter. All back injuries, whether they be superficial deep, are fraught with most serious consequences wh the upper cord is involved, for not only is muscular pr tection less fully provided there, but the vertebræ a themselves less strongly constructed, and the liability delicate parts to injury is sometimes very great. T phrenic and pneumogastric nerves may be injured ev

as the result of a strain, when the upper cervical vertebræ are unduly twisted.

CASE XXXIII.—Holmes reports the case of a man who when playing with his child got down on his hands and knees, and when springing forward tripped and rolled over with his head under him. The weight of the body came with an impulse on his neck, and gave him much pain from the twist it caused. He lay motionless for ten minutes, and then found, on attempting to rise, that he could not use his arms or legs; and there was general dysesthesia. There were no tactile anesthesia and no pain except over the fourth cervical vertebra, where deep swellings could be found. In twelve hours motor power was restored. He subsequently recovered entirely, but for a long time was unable to rotate his head, and was obliged to turn his entire body.

CASE XXXIV.—The writer recalls a personal case of an army officer who, when riding in an ambulance, was thrown so that his head struck the top of the vehicle, when the front wheels suddenly dropped in a hole. The result was that his head was suddenly bent forward. Severe localized pain over the cervical region, dilatation of the pupils, disorders of respiration and circulation, vertigo, were features of a long train of symptoms which extended over a period of years, and led to his retirement from the service.

CASE XXXV.—Another case which depended upon a fall into a sewer culvert was that of a woman who in consequence sustained a rupture of the latissimus dorsi and trapezius muscles of the left side, so that not only were there excruciating local pains, but she could not bend her head forward or turn the upper part of her trunk without agony. In this case there was a comparatively rapid recovery in less than a year.

These illustrate different forms of trouble of a comparatively light grade. There are others in which progressive or immediately fatal symptoms may occur, even when there is no fracture or impact of broken bone, but these latter are uncommon. Happily the lumbar region is the commonest site of sprain and muscular accidents,

and the dorsal is exempt, except when, as Golebiewski pointed out, the articulations between the transverse p esses and the ribs, or between the ribs and the bodie the vertebræ, are involved, when a painful condition sults. This form of sprain, however, is very apt to connected with some fracture of the ribs themselves.

Case XXXVI.—W. H. D—— was injured in an acciden the Erie Railroad on March 16th, 1893. The man was in middle of the rear sleeping-car when it was run into by the l motive of another train, and he knew nothing until he found h self under the débris, and was aroused by a person crying by. He was helped to his feet, but could not stand becaus weakness and pain. He was carried to the Lackawaxen de where he remained for a time, and was then taken to the hospit Port Jervis. He suffered from pain in the right side and back, fr pain and numbness of the right forearm, due to a bruise over olecranon process, and from local nerve injury with paralysis, a cuts upon the head. He was also slightly cut about the feet a back, and was extensively bruised. Three lower ribs on the ri side and two on the left were found to be fractured, and he w placed in a plaster bandage. He found it difficult to swallow speak for the first few days, and suffered from severe pain o the four or five lower costo-spinal articulations. The writer amined him December 2d, 1894, and found the subject to suffering at that time from a great deal of helplessness, due pain and rigidity, which practically extended from the nucha the coccyx, and with severe pain upon pressure over the lo dorsal vertebræ. He could not walk without help, and only th for a short time and with an increase of suffering. His back p was so great that he was obliged to change his position frequen and he suffered from a certain amount of nervousness and ap hension, while neurasthenic symptoms with twitching of b legs shortly developed. There was no muscular atrophy, and muscles responded to both currents. His reflexes were nor and his vision was unaffected. His recovery was slow.

TRAUMATIC LUMBAGO

is attended by complaints of intense pain, chiefly in the small of the back, which interferes with bodily movement, and enforced quiescence and a fixed attitude are the result. There is the "fear of movement" which is recognized so often, and dwelt upon so much by Page. When the patient uses his arms and legs, he contrives to do so without bending the body or using the muscles of the trunk, so great is the distress, his attitude and whole bearing expressing suffering which he would evidently gladly escape. There are a timidity and appearance of weakness which bring with it a certain degree of caution, and sometimes the gait will be peculiar, as the subject, perhaps, gets more ease in progressing sideways or taking short and hesitating steps. Page has called attention to the interference with free micturition by reason of the lack of natural support and help which the lumbar muscles provide when this act is being performed. Constipation is common, and is probably the result of the general atony. Traumatic lumbago may closely imitate and suggest a more serious condition of meningitis perhaps, and may be associated with local muscular atrophy which is sometimes deceptive, conditions of rigidity, and perhaps a neuritis of superficial nerves.

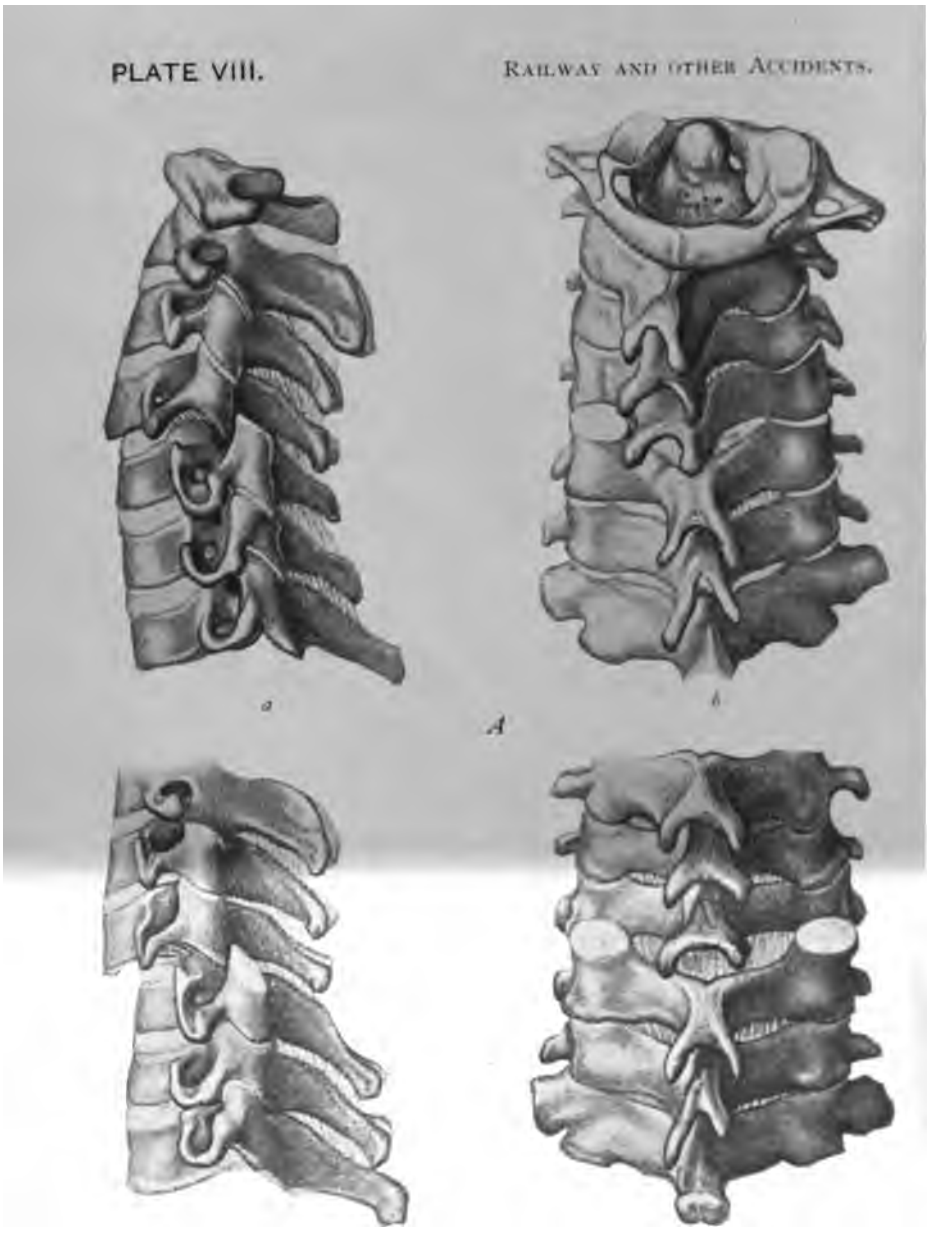
CONTUSIONS OF THE CORD

without any decided indications of vertebral injury, and of kyphosis or distortion are met with, and are ordinarily serious and progressive.

CASE XXXVII.—J. A——, an army officer, consulted the writer in 1882 for the relief of a condition following an accident in

1879, when he was thrown from a wagon, striking upon the left side and cutting and bruising the leg and thigh of that side and wrenching the right leg and back. According to his statement, he was not at first insensible, but fainted, and remained unconscious for a few minutes. His injuries were supposed to be comparatively trivial, and he resumed his duties in his regiment in two or three days, doing light work. Within a short time he became nervous and was unable to sleep as he had been able to do before the accident, and was obliged to come East. Since July, 1879, he has suffered from various symptoms, such as pain through the lower part of the spine, over the first and second lumbar vertebræ, which sometimes extends upward or about the body. He has in addition dull pain at the back of the head, but no vertical pain, and none in the arms. He has sciatica from time to time, as well as pain in the ankles, more especially the left. It is impossible for him to get a comfortable position, and he sits on one side of the chair. He cannot rise from his seat without great difficulty, and there not only seems to be aggravation of the spinal pain, but some loss of power as well. There is difficulty in going up-stairs, and he usually does so laterally, the right leg being put in advance of the left. He limps slightly with the left leg, which is decidedly weaker than the right, and when tested the electrical reaction is diminished, but there is no atrophy. The left knee-jerk is absent, and the right is exaggerated. He co-ordinates well, and can stand with his eyes closed. He cannot turn over in bed without first sitting up, and has very great difficulty in arising from the recumbent posture. There is some incontinence of urine, as well as constipation. He has had vertigo and blurring of vision, but no ocular changes are to be discovered. His speech is somewhat affected, there being a clumsiness as well as an actual transposition of words. By far the most interesting feature of the case is the manifestation of trophic changes. The skin was white and soft before the accident; within a year a peculiar bronzing and mottling appeared about the ankles, which were covered with morphea, there being more discoloration perhaps on the left side than on the right, and there is some swelling.

This patient has received very little benefit from treatment of any kind, and it is very probable that he has a serious organic change of both brain and spinal cord. His recovery is very doubtful.



ARTIFICIALLY PRODUCED DISLOCATION OF THE CERVICAL VERTEBRÆ.

Fig. *A*, *a* and *b*, show unilateral displacement of the fourth vertebra, the articular process of which projects in front of that of the fifth. The forward projection of the vertebral body on this side is shown in *A*, *a*. The adduction of the head to the right and the deviation of the spinous processes are seen in A, *b*.

Fig. *B*, *a* and *b*, Symmetrical dislocation of the fourth cervical vertebra forward from forced flexion.

constricting pressure. This latter is more common, as has been said, in the cervical region, or it may be associated with subsequent inflammation of the intervertebral discs farther down, with kyphosis, and possibly with the formation of ischial abscesses. Incomplete vertebral fracture with contusions of the spinal cord may be intractable and dangerous sequelæ of accident, insidious in development and slow in progress. It is often difficult to diagnose in the beginning because of the absence of any external deformity, and of the resemblance to a variety of other affections, and for the reason that extradural hemorrhage, or possibly a meningomyelitis, may be caused. The injury may at first involve the substance of the body of the were tebra, which, according to Golebiewski, becomes softened, and for at least a year (or so long as the patient remains in a recumbent position) there will be no expressed symptoms of trouble; but when he arises and attempts to walk the weight of the body above will lead to compression, the formation of a spinal projection, narrowing of the intervertebral canals, pressure upon the spinal nerves, and

FIG. 21.—Deformity due to Traumatic Spondylitis. (Golebiewski.)

Fracture of the Sixth and Seventh Cervical Vertebræ with Crushing of the Spinal Cord. The patient was a woman, aged thirty-three, who lived seven days after the accident, death being due to respiratory failure. During life there were sensory and motor paralysis of the trunk and lower limbs, and partial paralysis of the upper limbs; the upper limit of the sensory paralysis was at the level of the third rib. There was retention of urine. In the region of the sixth cervical spine there was marked projection, which, under an anesthetic, could be obliterated. The illustration shows the fracture of the two vertebral bodies and the projection of the seventh backward, producing narrowing of the vertebral canal and crushing of the spinal cord. (Helferich.)

possibly of the cord itself. As a result there are a great deal of local as well as radiating pain from the neuritis, increased reflexes, and possibly subsequent symptoms of cord invasion. The appearance of such a patient is very characteristic, and Fig. 21 shows the peculiar bent position and kyphosis in an old case reported by Golebiewski. Sometimes the local injury is of such a nature as to give rise to certain symptoms suggestive of spinal-cord disease, there being no apparent indication of actual caries.

CASE XXXVIII.—Such a misleading case as is described above was seen by the writer, as well as by Drs. Stimson and Clymer some years ago, in which the diagnosis of Pott's disease had been made by the late Dr. Sayre. The plaintiff was a man who attempted to control a pair of spirited horses, but was unable, his light wagon being drawn into a hole in one of the public thoroughfares. The accident occurred upon a rainy night, and he was exposed for many hours, remaining in his damp clothes. So far as was shown by the evidence his only injury was a sprain, caused by his being pulled half-way across the dashboard. From the time of the accident he complained of severe spinal pain, which, however, was not localized until a few days subsequently. It was found, however, when examined within a year that he complained of pain at several points in the spinal column, which was more intense perhaps over the first and second lumbar vertebræ. There were absolutely no deformity and none of the symptoms of spondylitis; but a few months after the accident he began to develop symptoms suggestive of inflammation of the postero-lateral columns of the cord, exaggerated knee-jerks and spasticity. After the trial of the case, which resulted in a heavy verdict for the plaintiff, his symptoms progressed, and within two or three years he died of exhaustion, there being preceding paraplegia with symptoms of lumbar-cord disease, and at the autopsy there was found not only extensive inflammation of the bodies of the first and second lumbar vertebræ, compression and destruction of the cord, but an adjacent large abscess several inches across in the deep muscular tissue.

In this case the diagnosis of Pott's disease was in the nature of an inspiration, for every indication favored the diagnosis of an initial spinal-cord lesion, possibly a central hemorrhage occupying the posterior and lateral parts of the cord

Symptomatology of Cord Lesions.

Much depends upon the extent of the lesion, its level, and the invasion of other parts, either by ascending or descending degeneration in a manner well known to neuropathologists, when in addition to the immediately produced symptoms there are others which subsequently appear. As has been said, the cervical cord is much more vulnerable, and injuries thereof are apt, if not fatal at once, to be exceedingly grave. A transverse section of the cord above the fourth cervical segment is usually followed by death in a few days, if not immediately.

In consequence of such a lesion we find respiratory paralysis through destruction of the fibres of the phrenic nerve. If the cord be but half destroyed, this disturbance will be unilateral, the diaphragm being inactive, as well as the intercostal muscles, on one side only. Total transverse destruction is, of course, followed by complete paralysis below the level of the lesion, the arms being the seat of flaccid paralysis with disappearance of the reflexes, though the Babinski reflex may be found. There is also general anesthesia, which usually does not extend up to the level of the lesion, and the rectum and bladder are paralyzed. Certain peculiarities in cervical paralysis are presented which depend upon the direct or indirect injury of different parts of the upper cord. Thus, if the fourth segment be injured alone, the loss of power will be con-

fined to the muscles supplied by the brachial plexus and the rest of the upper extremity, while, of course, motor and sensory function below the lesion is abolished. If the injured part be at the level of the sixth segment, the shoulder muscles will be paralyzed; if the seventh and eighth segments be involved, those supplied by the ulnar nerve will be paralyzed, the muscles on the radial side of the forearm escaping. A lesion at the level of the first dorsal and last cervical segments will be expressed by a loss of power of the small muscles of the hand; those of the arm and other superior parts escaping. In all of these forms, of course, there will be more or less paralysis of motion and sensation below the lesion.

A transverse lesion of the dorsal cord is followed by a loss of power of the trunk and lower extremities, bladder and rectum, perhaps by atrophy with the reaction of degeneration, by anesthesia of all kinds, and, as a rule, by increased knee-jerks, ankle clonus, and spasticity. Should the patient survive there may be a complete loss of the reflexes, and possibly contractures. Compression or destruction of the lumbar cord is followed by complete paralysis without spasticity, by atrophy, by a disappearance of the reflexes, except that of the sphincter ani, and by deep anesthesia. A modification of the paralysis may occur when the cord at the level of the first lumbar vertebra is involved, when crural nerve paralysis takes place. In lesions of this region, as in others above it, we find paralysis of the bladder and rectum. Injury of the sacral cord is followed by much more limited loss of power, the muscles of the foot being those affected, and the anesthesia is not general, but confined to parts supplied by the terminal branches of the peroneal nerve. There is incontinence of urine and feces

as a result of sphincter paralysis, and the anus is often anesthetic. The reflexes do not undergo any alteration.

When the coccyx has been subjected to violence, there is not so much liability to injury as in regions farther up, and the chief expressions are local pain, sciatic paralysis without rigidity of the lower leg muscles, possibly the glutei, and perhaps the quadriceps femoris. There is a disappearance of the lower reflexes, sometimes vesical weakness and atony or actual paralysis of the rectum, while sciatic pains, as well as coccyodynia, may be found; a resulting sciatic neuritis is a possibility. Muscular twitchings occur in a certain number of cases. Serious injuries of the coccyx and sacrum may follow falls upon the buttocks, and it is rare for fracture to occur from a trauma unless the force be directly applied. There are exceptions, however, and a curious one that has fallen under the writer's notice may be mentioned, where a glancing blow delivered by a jet of water under very great pressure produced a fracture of the lower part of the coccyx and serious nervous symptoms as well:

CASE XXXIX.—The patient, E. W. G——, was standing near a hydraulic cylinder about eight inches in diameter and possibly about two feet in length, which was used to pack gunpowder in another cylinder in front, and which burst. Just previous to this the water pressure had been tested and was found to be a trifle over thirty-five hundred pounds per square inch. The patient's story is as follows: "That this pressure was not too much was shown by the fact that I had operated a piston two or three times without trouble. Then the hydraulic cylinder burst, which, I think, must have had four thousand pounds or more pressure per square inch on the water. The position I occupied was thus (Fig. 22), standing almost against the cylinder and facing the direction of the arrow. The fracture is thus shown by the letter *A*. Thus, you see, the water struck me at an angle of about forty-five

degrees. Nothing but water struck me, which started at the height of and slightly in the rear of the hip-joint, following the contour of the buttock. This was forced over to the right side of me, and subsequent examination showed that the fibres and tissues had been completely destroyed, so much so that I could not stand the touch of the hand, and after the second or third day it felt exactly as if the skin contained a liquid instead of meaty tissues."

Two weeks afterward, the local injury, which occurred May 3d, 1899, had been entirely recovered from, but he suffered from intense pain in the hip and spine. It was a few weeks after this that he was brought to the writer by his physician. He was in a distinctly nervous and apprehensive state, his mind being full of the accident and its results. His physical appearance was very good in every way, although I was informed that he had been

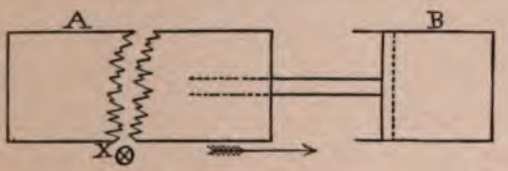


FIG. 22.—A, Hydraulic Cylinder; B, Powder Compressing Chamber.

sleepless and constantly despondent. A very careful examination revealed the absence superficial of tissue changes. His subjective complaints were those of intense pain in the hip and spine, there being three hyperesthetic spots, one just below each shoulder blade, another in the lower dorsal region, and in addition there was intense coccyodynia. The actual cautery and injections of atropine for several months were without benefit, and in June, 1900, the end of the coccyx, which was found to be fractured and twisted, was removed, and for a week or ten days there was an absolute disappearance of pain in the affected regions. While the operation was very successful, it was later followed by intense pain and ischuria, the patient not urinating for seventy-two hours, and then with great agony. He continues: "About two weeks after the operation I was boarding a trolley car, which started just as I was about to sit down, the result being that I was thrown backward against the metal arm of the seat, striking on the remaining end of the spine. From that time on I have never been free from pain. I remained away from all work until the latter part of

September without any change in my condition The pain at times has been so intense as to make me sick." Renewed application of the actual cautery somewhat relieved the patient, but there was a relapse when it was stopped. In November, 1902, he writes: "My nervous system I believe to have been badly wrecked as compared to my condition previous to the accident, when I did not realize the meaning of the word nervousness. This may be due to the great loss of physical strength I have undergone. . . . I cannot place any reliance, however, on the strength of my left leg, which has been so weak at times as to cause me to drop to my knees. When ready to retire, it is my custom to sit on the edge of the bed and then to swing my legs over and under the cover. This action, or probably the slight bending in the body, causes an extremely acute pain in a spot about five or six inches above the end of the spine—the middle point spoken of before—which feels just as if a sharp knife had been thrust into me. This lasts for a moment, and gradually fades away. I have noticed this for the last six or seven months only, but it occurs regularly every time I retire. My most comfortable position in bed is one in which my knees are drawn up close to the body." There was no suit in this case.

Care should be taken when persons present themselves for medico-legal examination to ascertain the existence of an old fracture with coccyodynia, for it is sometimes found in women with deformed pelves who have experienced this accident during labor.

A number of very characteristic manifestations attend injury or disease of the superior cord extending as far down as the seventh cervical vertebra, and are bilateral or unilateral according to the extent of destruction. Some of these depend upon injury of cranial nerve fibres, proceeding from the upper part of the cord, while others are due to irritation or actual paralysis of the cervical sympathetic. They may consist of contraction or dilatation of the pupil, or insensibility of the same to light stim

*lat*ion, ptosis, flushings, and increase or diminution in temperature, hyperidrosis, and glycosuria. In many cases *in* which the injury has been indirect slight symptoms of *this* kind, and for the time not associated with any considerable degree of paralysis either of sensation or motion, may exist for some time, or they may be expressions of a graver state. Buzzard reports cases of traumatic diabetes, and is of the opinion that this phenomenon is not due to concussion, but to severe injury, in which conclusion the writer fully agrees. It should be borne in mind, however, that many of the persons who present themselves as litigants, claiming that they have traumatic diabetes, have in reality been victims of the disease for some years previous to the alleged accident. If, however, there be no such history, but some local distress, actual paralysis, possibly speech disturbance, an increase in the pulse rate, anesthesia of varying grade, and an immediate and great loss of flesh, the case may perhaps be considered traumatic.

Certain trophic changes are highly characteristic of traumatic cord disease, although they may occur in other forms of myelitis. Among these are bedsores and other results of pressure, and certain forms of cutaneous lesion. The former may be found at points where the weight of the body is greatest, and if they be at all extensive may result in sepsis, which is one of the immediate causes of death. Injuries of the dorsal cord are apt to be associated with turgescence of the penis and occasional obstinate priapism. The bladder and rectal symptoms vary very much in regard to the level of the lesion and its importance, and there may be retention, pain, and strangury, or atony, or incontinence, partial or complete, while the latter may vary from simple constipation to in-

voluntary passage, which depends as often as anything else upon anesthesia of the lower gut and anus, or upon actual paralysis of the constricting muscles. The surface temperature of the paralyzed parts is usually lowered, and the skin is mottled and badly nourished. Local pain is unusual except where complicating meningitis exists, or where there is some disease of the bones or involvement of the posterior nerve roots.

Peripheral pains in the muscles or nerves are found under some circumstances, and are increased by movement or the erect posture. Lesions of the cord pure and simple are not attended by pain; but if they occur and persist for any length of time, it is quite possible that these are due to carcinoma or to the presence of some other tumors, or to aneurism. Severe pains extending down the back of the thighs and legs are due at times to dorso-lumbar injury or disease, and annoying intercostal neuralgia may have the same origin. Some authors contend that the anesthesia attendant upon myelitis of this region is not so profound as with lesions of other parts of the cord; but this applies chiefly to indirect and incomplete lesions.

The disturbances of sensation incident to the formation of local foci of disease are as follows: When the lesion is situated at the level of the fourth cervical segment, the area of anesthesia is confined to the shoulder and outside of the arm; when at the fifth, to the outside of the arm and forearm; when at the level of the sixth, to the radial half of the hand; when at the seventh, to the inner side of the arm and forearm, and at the eighth, to the inner side of the hand.

When the lesion corresponds to the first dorsal seg-

sustained a vertebral fracture or dislocation is us
striking, although there are cases in which the defo
may be so slight as to be almost imperceptible. I
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and improve to a certain extent, we find especially i
cervical region a malposition of the bones, so tha
patient's attitude is one which is impressive and not
forgotten. This consists of rigidity, the maintenanc
fixed position, and the inability to rotate the head. \
the spinous processes are fractured there is a pos
thickening, and when the head is flexed or turned
one side to the other the deformity becomes p
visible. Occasionally the head is thrust forward,
maintained in that way. If the mouth be opened, it
be possible to notice at the back of the fauces the b
of the dislocated vertebræ. In dorsal fracture it is a
ter of ease to detect the same immobility and the po
detachment of the spinal ends of the ribs as far do
the last segments. In old cases, in which absorpti
the body and the cartilage has taken place, we fin
familiar kyphosis, and the normal curves are change

It has been observed that a fractured sternum a
suggests vertebral fracture. Not only is there a
change in the relation of the vertebræ themselves i
tain forms of dislocation and fracture, but certain
iarities in movement and gait are apparent. The pa
is not only inclined to keep his body straight, but
not stoop as an ordinary person would, but helps hi
in recovering from the bent posture by placing his l
upon his thigh, as children do in pseudo-hypertrophi
alysis. Exaggerated lateral curves are often present
side movement is exaggerated at the expense of fl

opposite side there is anesthesia. Slowly advancing and irregular compression with myelitis, which is preceded by thickening of the dura, the general formation of adhesions, and the constriction of the cord and nerve roots, is apt to occur with characteristic pains, paralyses, and trophic wasting, and a spastic condition. A case of this kind came under the writer's notice some years ago, which admirably portrays the development of a cervical pachymeningitis consequent to dislocation.

CASE XL.—J. B. M—— received a blow from a club in th hands of a highwayman. Beyond the production of a sho period of unconsciousness, succeeded by headache, vertigo, a pain, loss of power and numbness in the arms and hands, whi moderated and disappeared within a few weeks, no more seri symptoms were presented, and the would-be assassin receive comparatively light punishment. In the course of a year, howe the pain returned, and with it there was a loss of power connec with very great wasting of all the muscles of the arms. I first saw him in April, 1880, two years after the injury, and found, beyond the atrophy which was extreme, a great loss of substance of the posterior cervical muscles and left deltoid; there was a peculiar deformity, resulting apparently from the anterior dislocation of the third or fourth cervical vertebra, so that a depression existed, and the thyroid cartilage was very prominent, and the chin was thrown upward and forward. The upper extremities where the wasting began presented the appearance of those in a person suffering from an advanced form of progressive muscular atrophy. There was a flexion of the fingers with great hollowness of the palms, the flexor tendons being quite prominent and the interosseous spaces deepened. He could not put the left hand upon the top of his head, and when he raised either there was aggravation of the severe pain of which he constantly complained. His co-ordinating power and sense of localization were affected, and he could "do nothing without the aid of his eyes." He could not pick up a pin nor touch his nose even when his eyes were open; tactile sensation was not good; the tendinous reflexes were everywhere exaggerated; he was irritable and an

HEMORRHAGE BETWEEN THE MENINGES, C INTO THE SUBSTANCE OF THE CORD.

1. Spinal Meningeal Hemorrhage (Hematorrhachi

This form of hemorrhage consists of an escape blood between the dura and the arachnoid, or in t cavity of the arachnoid, or upon the surface of the co itself. It may follow various forms of disease, but usually due to a severe blow upon the back, the sudd lifting of a heavy weight, or to some form of extrer vertebral flexion, when it is immediate, or it may be secondary consequence at a later period of caries of t vertebral bones, produced in the first place by inju The development of symptoms, of course, depends mu upon the form and degree of violence and the quantity blood outpoured in a confined space. Naturally a he orrhage at a high level may by gravitation involve t lower parts, which may be subjected to destructive pre ure therefrom and ensuing inflammatory processe Sometimes the hemorrhage may be so small as to pr duce no determining symptoms, but ordinarily th rupture of a meningeal vessel is attended by a sharp an severe pain in that part of the back which has been su jected to injury. The patient usually falls to the groun and his sufferings are agonizing. There is a loss of mu cular power in the lower extremities which may b coincident with the pain, and almost complete from th beginning; or initial sensory disturbances, consisting prickling and other disagreeable feelings, which may b succeeded by anesthesia or hyperesthesia, but more co monly the latter. The loss of power and the other sym

of spinal fracture where at some time subsequent to injury itself there may, through the presence of necr bone or the detachment of a spicule, be serious vasc wounding and consequent unexpected hemorrhage.

Case XLI.—A case of a light grade seen by the writer Dr. H. L. Purdy, of New York, was that of an iron moulder attempted to lift a weight of three hundred pounds, whe suddenly felt a violent pain in the middorsal region, and, ping his burden, fell at the same time, and was unable to rec his feet without assistance, as his lower limbs refused to sup him. This was in July, 1903. After a few days there w slight return of power and a diminution of the pain, which for a week or two agonizing. Then ensued a girdle pain, w was worse at night. When seen by the writer, about the mi of September, 1903, the left leg was found to be weaker the right, while there were analgesia and a blunting of ta and thermo-anesthesia, but more markedly the former. The knee-jerk was slightly exaggerated. The electrical reactions undisturbed and there was no atrophy.

In other cases that the writer has seen the in symptoms were those described above, and were follo by paralysis and spasticity of the lower extremities, atrophy, and in exceptional instances by decubitus, haustion, and death.

2. Hematomyelia.

The escape of blood into the substance of the c itself is more apt to follow injury of the cervical reg than elsewhere, particularly in those cases in which patient receives a vertical head blow. Examples have b reported by Bailey and various observers where it has lowed the act of diving into shallow water, and in oth falls upon the feet from a height have preceded the oc rence of the hemorrhage. A distinction has been m

between the so-called primary focal hematomyelia where the hemorrhage is due to a disease of the blood-vessels or some other local condition, and injury not associated with any vertebral fracture, for in the latter there may be laceration or injury. In the primary form the violence may simply lead to some accident which may be favored by existing syphilis, tumors, or a form of myelitis. The development of symptoms may be naturally very sudden, as it is in the extramedullary form, or more slowly developed, when there will be a chronic and generally incurable train of expressions, due to the involvement of regions supplied by the central arteries of the cord.

TRAUMATIC SYRINGOMYELIA.

The consideration of this disease can hardly be undertaken without the foregoing, for the cavity which is formed in the cord is due to the hemorrhage. In this respect it differs from hydromyelia, which is a congenital condition. The condition in reality is a cavity in the cord, which is produced by the outpouring of blood and by a certain degeneration, and remembering the liability of the cerebrum to glioma as the result of injury, it is not surprising that the formation of gliosis tissue sometimes takes place in the central part of the spinal cord. The dominant and characteristic symptom of this disease is what is known as the *disassociation of anesthesia*—that is to say, that while tactile sensibility is preserved, there is a loss or diminution of the pain and temperature senses. This is connected with a form of atrophy which resembles the familiar progressive muscular kind. As a rule, the upper extremities are at first slowly attacked, and the wasting is preceded by dysesthesia and obscure pain. The atrophy

is symmetrical and general, and the degenerative reactio is present. The wasting and weakness at first are confine to the small muscles of the hands, but this is merely the b ginning of a general muscular atrophy. It is not uncon mon to find certain trophic changes and such cutaneou eruptions as herpes, pemphigus, and disturbances of secr tion, nervous edema, or a condition in a mild way resen bling Raynaud's disease; some of the trophic disorders r sembling those of locomotor ataxia are occasionally foun the nails thickening or dropping off, or there may be exte sive arthropathies and a liability to fracture. When disease becomes pronounced some lateral curvature of spine is usually found, which is most marked in the lo dorsal region. Ultimately we find the lower extremit involved, with a certain amount of hypotonia and creased reflex activity. Further extension of the centr lesion is expressed by rectal and vesical incontinence, a the patient dies from exhaustion or bulbar symptom The diagnosis is extremely difficult, and it is often im possible to discover the existence of the disease befo death.

CASE XLII.—Abrahamson reports a case of traumatic hem tomyelia which was rapid in developing, in which the patient fe striking the back of his head on the floor; a week and a h later there was numbness of the little finger of one hand, a twenty-four hours after the entire upper extremity became num Twenty-four hours after this both extremities became numb a weak, and on the fourth day of the trouble there was comple inability to move. The special senses were normal, there were e tensive wasting of the muscles and tremor of the facial musc on one side, the tongue was drawn to the left, the knee a Achilles jerks were exaggerated, the muscles were flabby, esp cially about the shoulders, there were no spasticity, no limitatio to the field of vision, and no Romberg symptom. The volume

his work. This patient became more helpless, and died in August, 1883, of the well-marked disease which had run an acute course.

The prognosis of the primary form is much better than the other. Even when there is complete paraplegia with total relaxation and flabbiness and lost reflexes there may in a short time be an altered condition of spasticity with ability to walk. It is not rare in the recoverable case for some residual atrophy and weakness to exist with slight increase of reflex excitability. Many patients recover entirely in a few weeks.[1]

PROGRESSIVE MUSCULAR ATROPHY.

Progressive muscular atrophy or wasting palsy is an affection characterized by gradually extending wasting of the voluntary muscles, which usually begins in distal parts and extends upward, involving various groups, and finally those which preside over the important functions of organic life. Consecutive to the wasting there are a paralysis of motion and, perhaps, a loss of reflex action, while coincident with the loss of substance there are vermicular contractions of isolated muscular bundles. Early quantitative loss to both currents and late degeneration reaction are found. There is no anesthesia, and rarely any other disturbance of sensation, except vague pains, which are undoubtedly peripheral. The disease was very fully described by Cruveilhier, Duchenne, Oppenheimer, Wachsmüth, and Roberts about forty years ago, although it was probably recognized by Van Swieten long before.

Modern clinicians, among them Charcot, have divided it into several varieties, and have made a more or less su

[1] Of course, true syringomyelia with degeneration is incurable, although it may become stationary.

cessful attempt to determine its pathology. The two chief subdivisions at present recognized include, first, a peripheral or myopathic form in which the muscles are first affected—the so-called dystrophies; second, a spinal form, the myelopathic or progressive muscular atrophy, which is of central origin. In this latter there may be rigidity and exaggeration of the reflexes, dependent upon an invasion of the pyramidal columns of the spinal cord and the anterior horns, the symptoms keeping pace with the destruction of the motor and trophic cells. Most of the older writers held that traumatism, and especially injury of the cord, may sometimes be a sufficient cause; but of one hundred and five cases collected by Roberts there were only six which were attributed to direct injury of the arm or hand, to excessive exertion in carrying heavy weights, and to falls. One doubtful case reported by this writer is that which began with atrophy of the ball of the right thumb, with a rather rapid progress of the disease, so that death occurred (preceded by an involvement of the respiratory muscles) in six months, the initial trauma being very slight. In all the original injury had been completely recovered from, and the nerve supplying the affected muscles was never involved. In the majority of cases we find the disease to appear between the twentieth and fiftieth years, and there are numerous causes that may be sufficient to account for it: among them exposure, most of the acute infectious diseases, metallic poisoning, especially lead, syphilis, mental strain, and more often than anything else the over-use of certain muscles in the performance of specia lacts. Mechanics, therefore, are peculiarly prone to the affection, and of twenty-eight cases reported by Dana the victims were smiths, ironwork-

ers, bricklayers, tailors, barbers, locksmiths, etc. The writer has not only seen it among these, but has found it as a result of constantly repeated and almost automatic use of the fingers—in cigarmakers, printers, typewriters, and clerks. He does not remember ever to have met with a pure case that was the result of railroad injury, although Bailey reports some which followed fall and injury of the hand and thumb, blows upon the nec and upon the chest; but in most of these there seems have been some such complication as exposure or syphi and in the others there is at least a suspicion that t injury produced some other trouble as well as the d ease under consideration. One contested case in wh the writer appeared was that of Hoey *versus* The Met politan Street Railway, where it was alleged that t plaintiff was well up to December, 1899, when he w injured. He received an injury of the head and righ leg and a lacerated wound of the right hand. The phy sician who was called upon the evening of the first day found him highly excited, hysterically crying and laughing. For several days he was delirious and afterward apathetic for nearly three weeks; he vomited often during this time, and there were insomnia, very great exhaustion, and some spinal pain. His pupils were dilated, and afterward did not respond to light. At the end of three weeks there were coldness, numbness, and twitching of the right side. The examining physician found wasting of the right hypothenar eminence at this time, and later the claw-finger appearance, or *main en griffe;* there was general tremor of muscles throughout the body, with some twitching. He left his bed in March, 1900, and could not walk without assistance. He grew worse all this time, hi

muscles gradually wasting and his strength diminished. Dr. Bailey, who examined him, found the "electrical reaction slightly diminished." From the time of the accident until August, 1900, he had lost forty pounds in weight, and in September there developed evident pulmonary tuberculosis, with night sweats, rise of evening temperature, and areas of flatness; but it does not appear that any bacteriological examination was made. He died September 30th, 1900, and suit was subsequently brought. It was shown that the deceased had been engaged for a long time in the mailing department of a large metropolitan paper, and that he was constantly employed in performing a particular kind of movement in which the right thumb participated. It does not appear that any one had ever looked for commencing atrophy before the accident, and the history of the case itself does not seem to be strictly in accord with our knowledge of the affection. There was no reaction of degeneration in the extremely atrophied muscles, but simply diminution of electrical irritability, and there was no recorded alteration of the reflexes. The patient's condition after the accident was not such as to lead one to look for progressive muscular atrophy, and it is very doubtful if such a general condition of wasting as that described could so quickly follow and extend as it did. In all probability the patient's rapid decline and death were due to infection, and were favored by his confinement and hard work.

LOCOMOTOR ATAXIA.

Locomotor ataxia is here used instead of tabes spinalis, which latter term must always be associated with an actual and slow degenerative lesion of the pos-

terior columns with proliferation of neuroglia cells. When Duchenne adopted the former, he undoubtedly, to some degree, had in mind the clinical rather than the pathological character of the affection, and for many years it was made to include symptoms due to lesions both of the cerebellum and of other parts, as well as of the cord itself. In these days of advanced neurology the first are usually recognized without difficulty and given their proper place, and are differentiated from the consistent symptomatic picture, which is the true tabes. In the present connection it is adopted for convenience to include the various sensory and ataxic states, which may be explained by injury of the posterior nerve roots without necessary involvement of the cord itself; by toxemic or consecutive lesions, or by peripheral or hysterical anesthesia, which gives rise to the inco-ordination and other of the symptoms which belong to this grave disorder.

The possibility of injury as the cause of ataxia has frequently arisen in connection with litigation, and many cases have gone into court presenting a trauma dependent upon a railway accident which has been alleged to be the sole etiological factor. These cases do not seem to have been considered true examples, for there is almost complete unanimity of opinion that genuine tabes—that is, the form with arthropathies, optic-nerve atrophy, Argyll-Robertson pupil, and gastric crises—can have no such origin, but in most instances is explained by syphilis. It has been maintained that when the symptoms develop in a conspicuous manner immediately after an accident, it is probable that they have been expressed in a minor degree for some time before, and have not been recognized

by the patient or his physician; or else have been mistaken for the expression of some other disease. In other words, they are the lighting up of a long dormant affection. Walton, of Boston, whose industrious researches in this field of medicine are entitled to the highest credit both for their thoroughness and for their originality, some years ago investigated all the alleged traumatic cases, but was unable to find one entirely uncomplicated. Bailey, while reporting a case in which the appearance of a number of classical symptoms almost immediately followed a fall upon the buttocks, and in which there was no history of syphilis whatever, is as much in doubt as others about the relation of trauma to tabes, inclining to disbelieve in the possibility of such a connection. The writer, whose experience has been large, while perfectly convinced that a consistent and progressive case of the disease as a result of injury is practically unknown, has seen so many patients in whom the trauma either lighted up a spinal syphilis or gave rise to a group of symptoms due to nerve-root injury, or consecutive to spinal laceration, that he does not feel inclined to dismiss the possibility of a locomotor ataxia, which may very closely resemble the form which is universally supposed to be so distinct an entity. It need hardly be said that rapid local tissue destruction, or its aggravation in connection with syphilis, is often due to excessive use of alcohol, and doubtless violence when suddenly applied, is in some cases capable of rendering a long-standing and inactive syphilitic deposit capable of producing local toxemia and resulting mischief in the cord.[1]

Although Marie, I am informed, performs lumbar

[1] The so-called parasyphilis.

A B

FIG. 24.—A, Gait in Traumatic Locomotor Ataxia; B, Static Ataxia in the same case. (Cinematograph by author.)

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some of the peculiar symptoms of the spinal affection. In some cases of fracture, an accident to which tabetics are prone, it will not be difficult to get a history. The same may be said of perforating ulcers and of the earlier trophic disorders, which by the uninitiated are supposed to be due to ordinary conditions. The gait has a certain uniformity, and the patient brings his heel down first, there being some spasticity, and it is only in the old cases that the disorderly titubation which is characteristic of dementia paralytica is found. These facts are thus fully referred to because in the irregular cases to which attention has been directed, one must be impressed by a certain peculiar disorder in progression. In most of the reported cases which are claimed to be traumatic there is, with but few exceptions, a history of sudden development and irregular progress, and usually a very rapid development of symptoms, the preataxic stage being short. The dominant sensory expressions of ordinary tabes do not appear to be important in this form, and the pains are rarely so intense as to need morphine. In cases which have come under the writer's notice, girdle and radiating pains have caused more suffering than those of the extremities, and even when the disease has advanced there have been no abdominal crises. The anesthesia has been irregular and rarely bilateral, except in one non-traumatic hysterical case, while in another the anus and lower rectum were anesthetic. While the knee-jerks were lost, the writer has never found the lost pupillary reflex, and in no case has there been any optic-nerve neuritis or atrophy. One of the striking and suggestive differences is found in the gait, which is far more disorderly in locomotor ataxia after trauma than in tabes of organic origin, in which

there is usually a syphilitic basis. While the heel impact and the trajection that belong to the ataxic gait are present, there seems to be at an early date a great deal of unsteadiness and disorder, thus resembling the Friedreich type, and when the patient progresses the action of the quadriceps is exaggerated so that the knee is lifted higher than it is in the ordinary case of tabes, and there seems also to be a species of lateral wobbling or unsteadiness (Fig. 24). This lifting is not to be confounded with that associated with certain forms of peripheral neuritis. True arthropathies are not found in the cases to which reference is here made, and when present, as Bailey and others have pointed out, there is undoubtedly an antecedent history, and they are not attributable to injury alone. The traumatic examples that are apt to be met with are of three kinds: (1) Hysterical and neurasthenic forms—the pseudotabes of the French writers. (2) Residual cases in which, after laceration of the cord, there remains a lesion of the posterior columns. (3) Cases in which, through wrenching or twisting of the body, there is tension or actual torsion of the posterior spinal nerves, traumatic neuritis with predominating sensory symptoms. (4) Cases due to initial injury with a recurrent hyperemia and pressure.

Hysterical locomotor ataxia is, of course, attended by none of the inevitable deep indications of central degeneration, which belong to true tabes; yet it may present the sensory and motorial indices of the real affection which are calculated to deceive some people. The anesthesia, as a rule, is much more profound, and is rather sudden in its appearance, and the ataxia is coincident and sometimes marks a sharp début. There are never pre-

ataxic, lancinating pains, but ill-defined dysesthesia, and there is, as a rule, a neurasthenic basis with the general familiar symptoms.

CASE XLIV.—In a case seen by the writer analgesia existed, and was complete and extensive. While the superficial reflexes were abolished in response to irritation of the anesthetic area, the knee-jerks were preserved and the pupils reacted normally to light. The ataxia was confined to the lower extremities, and if the patient closed her eyes she became agitated, emotional, and dropped to the ground, crying aloud as she did so. There is in tabes itself a period of swaying and toppling, however short, which precedes the fall, and the patient strives to balance himself by laterally extending his arm; but there was nothing of the kind with this patient. There was a vesical spasm with considerable discomfort, but neither retention nor incontinence. The only visual disturbance was asthenopia, and the eye field was normal. She had before presented certain stigmata of hysteria, and was of a nervous family—her brother, with whom she lived, having had tabes. A trifling fall was the alleged cause, but undoubtedly there was some imitative tendency as well. After a few months' treatment a cure was effected, principally through the use of the induced current, the patient being isolated meanwhile. The entire duration of the symptoms was less than a year.

CASE XLV.—In contrast the case of J. R. G—— is interesting, because of the rapidity of its progress and its direct connection with an undoubted spinal injury—possibly a laceration. It was impossible to determine the existence of syphilitic infection, and it is the writer's opinion that his present condition dated from an accident in the Harlem tunnel, which occurred January 8th, 1902, when there was a rear-end collision, and the patient was thrown forward, receiving a severe wrench and possibly a blow in the dorsal region, for there was resulting severe and obstinate pain which lasted some time. According to his story, he was able to leave the car, but was unnerved, and rapidly became neurasthenic and demoralized. After this he did not dare to do anything requiring mental or physical effort, and was timid to a degree. He could not walk on a fallen log over a stream when in the country, and found it impossible to move about his room at

night in the dark, or place his hands over his eyes when he washed his face without pitching forward. In April or May, 190[illegible] he began to have "rheumatic pains" and a painful girdle at level of about the edge of the lower ribs. He has had fulgurating pains in his legs since May, 1903, and pretty much all of the year 1902 he had trouble with the bladder, passing his urine very slowly. His general break-up was so great that he went abroad in the spring of 1903, where a diagnosis of locomotor ataxia was made by Purves Stewart, of London. The doctor wrote me September 26th: "His pupils are rather small, but react normally to light and on accommodation. The optic discs and cranial nerves are normal. He has no loss of sensation on the face, trunk, or limbs to lightest touches or pricks; but along the ulnar borders of hands and inner sides of soles, including the great toes, pinpricks, though felt acutely, are accompanied by a peculiar tingling sensation; pressure on the ulnar nerves behind the internal condyles is painless. The sense of position on passive movement is impaired at the toes, ankles, and hips, fairly good at the knees. There is distinct hypotonia of the calf and the hamstring muscles. The gait is ataxic, his handwriting is deteriorating, and he feels himself clumsy when buttoning his clothes or when picking small objects out of his pockets. The knee-jerks, Achilles jerks, and supinator jerks are absent. There is some delay in micturition, and he is sexually impotent." Upon his return from Europe the patient consulted me, when I found all these symptoms, and evidently an increase of the ataxia, for he could ascend and descend the stairs only with the greatest difficulty, and he was in a very nervous and anxious condition, and so weak that he was obliged to spend most of his time in bed. There is the same hypotonia of the muscles of the hand as exists in the lower extremities, and he is unable to use them now at all except for gross efforts. In this case the same extreme disorderly walk is found that has been referred to when speaking of other traumatic examples, and the mental element is highly suggestive of that which belongs to the so-called traumatic neurasthenia. So far he has not responded to treatment, and it has been found necessary to direct complete rest and forced feeding.

Recurrent Ataxia.—Two cases of a somewhat interesting nature, from the fact that certain symptoms were

recurrent in both, that there was a history of injury, and that these recurrences followed undue exertion, clearly show that there is a form of traumatic pseudotabes with obscure pathogeny, but not necessarily classic posterior column degeneration.

CASE XLVI.—J. M—— is now (in 1903) 50 years old, and has been a marine engineer for a long time and is at present chief engineer of a coast steamer. His general health up to 1884 was exceedingly good, as were his habits, and it is impossible to find a history of syphilitic infection. In that year he fell from an upper deck into the fire-room of his ship, about twenty feet below, landing upon both feet. Strange to say, beyond a slight concussion, some tingling and burning of his lower extremities, and a slight loss of power, there were no immediate consequences. In a few days, however, he began to have pains suggestive of irritation of the posterior nerve roots, rather general analgesia of the legs and feet, myelasthenia, insomnia, and attacks of lumbar pain. Micturition was frequent and difficult, and there was slight tenesmus after the act. His sexual power diminished; he became neurasthenic and was obliged to give up his work. In 1886 these symptoms were supplemented by ataxia and difficulty in co-ordination, and his walk became "wobbly" and disorderly, there being at the same time great irresolution and timidity in finding his way about the streets.

He presented himself at the Hospital for Ruptured and Crippled in this city in the summer of 1887, when he came under my care in the out-patient department. Both knee-jerks were evoked with difficulty, but the pupillary and other reflexes were but slightly affected if at all. Under absolute rest, spinal cauterization, and cod-liver oil he recovered in eight months, so that he was able to return to his work and made regular trips from New York to Havana until the spring of 1899, when he contracted a Tampico fever and came to his home in Orange, N. J. In September of that year I saw him in consultation with Dr. Phelan, and found him bedridden. It was stated that he had been unable to walk for more than a month because of an extreme degree of ataxia that had rather suddenly appeared during convalescence, and when he made undue muscular exertion. When helped out

of bed, he walked with great difficulty, raising his knees and le very high and applying his heels to the ground in a jerking w quite different from the gait of true tabes. There was no ralysis of motion, but there was tactile and pain anesthesia of t plantar surfaces, the outer toes of both feet being specia affected. He had severe gastric and visceral pains suggestive crises, and at the time of the visit there was retention, and it v necessary to use the catheter. Both knee-jerks were still abse After cauterization and ergotin he began to improve, and on J uary 2d, 1900, he was able, after a few weeks of shore duty, take charge of a new steamer, and since then has been, with t exception of slight gastric disturbance, a well and strong man.

CASE XLVII.—The second is that of G. L. K——, a trave ling salesman of 33 years, who has never had syphilis, and whos habits are good. He smoked moderately, and occasionally toc beer or whiskey. About sixteen years ago, after severe mu cular action in lifting a heavy tray from a sample trunk, he su fered a sudden lumbar pain which disappeared under simple rer edies and was followed, as he said, by some swelling of knees ar feet. This in turn disappeared, leaving him with a sense weakness and a difficulty in locomotion which was due to ataxi There do not appear to have been any leg pains or any bladd disturbance. In a short time he regained his ordinary vigor, suming his occupation as commercial traveller until 1897. Wh in Columbus, O., in that year, he again performed an uncalled-f muscular act of a violent nature, which was followed by numbne in both limbs, which extended from the knees downward, the so of his feet being perhaps the most insensitive. According to l story, there was a variation in the extent of the dysesthesia well as a sort of intermission, there being a period of normal s sibility, which would last for four or five days, and was follow by an absolute loss of feeling. After a week or two of this gait became affected, and it was with great difficulty that could walk at all, because of lack of co-ordination. He recover from this attack in a few months, and apparently continued the best of health until eight weeks ago, June, 1900, when began to have characteristic pains in both legs, which shot through the feet; there were pains as well on the right side the head and right arm. There was, for a month or so, sc

numbness in both plantar surfaces, but this was not permanent. There was at times an imperative desire to urinate, but no other bladder symptoms. There was no constipation.

No Argyll-Robertson symptoms; both knee-jerks were feeble. His gait showed a well-marked ataxia, and when he walked he planted his feet far apart, tottered and staggered, but could stand with his eyes closed. Most of the motor symptoms were present, so far as the lower extremities were concerned, and it was apparently an exceedingly easy case for diagnosis. The history, however, of the two subsequent attacks and the rapid début of the present one impressed me, as I learn it had Dr. Osler.

From June, 1900, when I first saw him, he has continued to improve under treatment, which was kept up by his physician in Cleveland, O., with the result that by autumn his sensory symptoms had absolutely disappeared and his gait was but slightly embarrassed. He was able to go up and down stairs without difficulty, walk about in dark places, and do a great deal of work. During the winter of 1901 he came to New York again, and I was unable to find any ataxia whatever, although the knee reflexes were still feeble. At one of these visits I found a painful crop of herpes situated in the inguinal region and upon the dorsum of the penis. There were also one or two spots upon his neck and back; these were followed by great local irritation and some neuralgia. There were absolutely no other trophic or cutaneous changes. Up to the present time (October, 1903), there has been no return of the trouble.

The litigation cases are often fictitious, and might be at once dismissed from consideration were it not for the tendency which so often exists to thrash out medical symptoms in court by laymen who naturally know nothing about their significance.

Case XLVIII.—Such a case was that of Miss Z——, who sued the Metropolitan Street Railway Company. The medical testimony for the plaintiff was given by three physicians whose diagnosis of "locomotor ataxia developing from myelitis" certainly is an illustration of the weakness of certain kind of expertism. It was claimed that in an accident which occurred in February, 1896, she re-

ceived a blow on the back, that she was confined to her b[redacted] immediately, and there remained for fourteen weeks. One of h[redacted] physicians testified that there was paralysis of both lower extre[redacted] ities, as well as entire loss of sensation on the right side, *increase[redacted] knee-jerks*, and *ankle clonus*. The right leg was smaller than th[redacted] left, "the reflexes of the eye do not respond the way they sho[redacted] to *light* or *distance*." Another who examined her testified that the disease was "myelitis running into a form of locomotor ataxia subsequently." He found that "the so-called *patellar reflex was very much diminished*." There were "inversion of the foot, due to loss of power of the extensor muscles of the leg, loss of sensation, more particularly on the outer side of the right leg, diminution of the size of the right leg and *ankle clonus*." The alleged loss of sensation found appears to have been an analgesia. Another medical witness diagnosed the case as myelitis, and found partial paralysis of the right extremity, atrophy, contracture, ank[redacted]e clonus, *exaggeration* of knee-jerks, loss of sensibility to touc[redacted]n, temperature, and pain. All these examinations were made [redacted]t about the same time, and not only was there a conflict in rega[redacted]rd to the presence of the reflexes, but the first physician appears [redacted]o have had rather confused views as to the eye reflexes and the[redacted]ir significance; there certainly was no evidence of tabes.

The patient was seen by two doctors for the company, w[redacted]o found absolutely nothing at all, and regarded the case as one of malingering.

It appears from the testimony that the young woman had gone to a seaside resort and was actually dancing at the time when she was alleged to be incapacitated and on crutches.

CHAPTER VI.

PERIPHERAL NERVE INJURIES.

PERIPHERAL trauma occurs in so many different ways that the resulting effects are necessarily varied, and each case must be studied by itself with reference to the extent and completeness of destruction and the symptoms that may arise. Under some circumstances the initial damage and its after-effects are trivial, and even a slight injury may give rise to an obstinate condition of affairs. The writer has known of a man who in trying to board a car lost his foothold and was dragged a few feet, meanwhile retaining his grasp of the hand-rail. As a result there was an obstinate and painful subacute neuritis, as well as some paresthesia of the hand, and a great deal of discomfort which lasted several weeks. A slight blow at the elbow-joint usually does little more than produce an immediate tingling in parts below, yet it, too, may lead to a painful affection of the ulnar nerve, which is slow in disappearing. Again, as a result of crushing, puncture, or partial or complete section of a nerve, there follow a variety of disturbances of a painful nature, or a varying loss of power, the nerve trunk possibly degenerating when it is cut off from its central connection. As a result of these interruptions, a characteristic series of trophic alterations ensue, and are manifested by circulatory, muscular, and dermal changes, which will be later particularized.

As some of the peripheral nerves have a motor as well

as a sensory function, it is to be expected that pain or anæsthesia will coexist with the lost motility; but this association is governed by certain rules. If a mixed nerve be paralyzed, there will probably be an impairment of sensation, as well as motion; but when there is a restoration of the former, the anesthesia disappears long before the return of muscular power. In fact, the motor loss is always more complete and enduring than the sensory. It need hardly be said that the lesion of a purely motor nerve leads to no sensory disorder. The loss of power may vary from a simple amyosthenia to a permanent paralysis. This partial or total loss depends upon the amount of pressure to which the nerve is subjected, or to actual division of the nerve trunk. It has been found that if the latter be subjected to the pressure from a column of mercury the resulting loss of function will depend upon the weight applied, and if the peripheral part of the nerve be alone compressed, it will, of course, not be so severe as where the neuraxon is seriously damaged by greater pressure. Such pressure pareses are common enough among drunken people or those who during sleep lie in such a way that pressure is made upon a superficial nerve, and the writer has examined a man who had been pinned down in a wrecked car by a piece of timber, the result being a well-marked musculo-spiral paralysis in connection with other injuries of a graver kind; and in another case a fall from a distance of a few feet led to a protracted anesthesia of parts supplied by the ulnar, there being no external wounds or abrasion.

CASE XLIX.—T. L——, aged 62, in August, 1885, fell in a coal hole, striking his left elbow and coccyx; he was dazed but not unconscious, and suffered with pain throughout the vertebral

column. There was anesthesia of the inner side of the left hand and arm, which was present a year afterward, as well as atrophy and loss of the nail of the little finger; for four days after the accident he could not pass water. January 21st, 1886, he could not stoop or pick up a pin because of pain and vertigo; had subjective noises; was subject to insomnia, and got tired easily. The general symptoms subsided in eighteen months.

Traumatic peripheral paralysis is always easily diagnosed. If at all profound, it is apt to be obstinate and often permanent, as the nutrition of the muscles is lost, and they diminish in size, there being resulting atrophy and shortening, which lead to permanent contracture. Again, there may be deformities, which are the result of the contraction of opposing healthy muscles, which in the upper extremity may give the hand a peculiar claw-like appearance (*main en griffe*), if the ulnar nerve be wounded; or a series of other characteristic deformities may be present. The muscles are usually at first flaccid and limp, and when passive movements are made there will be no rigidity or resistance if the paralysis is at all complete. One of the most positive evidences of serious peripheral nerve injury is a degeneration that takes place in the nerve trunk itself, when, through section, it is disconnected from the central neuron. This is made known by a very decided and prompt change in its reaction to electrical stimulation, and that of the muscles it supplies. There are well-known laws which govern the behavior of muscles and nerves to *direct* and *indirect* electrization, and there are normal *qualitative* and *quantitative* responses which do not occur when a peripheral nerve is severed from its base of supply; when we find that both the galvanic and faradic or induced currents do not awaken the same excitability as they

did before. Usually within forty-eight hours after such section the nerve becomes less susceptible to the stimulus of the induced as well as the galvanic current, and this diminution gradually extends from the point of interruption toward its distal portion (that is, the periphery), and in about fourteen days it becomes insusceptible to both currents, and perhaps forever loses its capacity to conduct. In cases in which the paralysis is not permanent there will be a gradual return of susceptibility to the stimulation of both currents and a restoration of function when the process of repair is complete. When the muscles themselves are tested, it will be found that they will contract when the induced current is applied, and there is not much impairment until the end of seven days. In another week, however, the excitability has gone entirely. While they respond to the galvanic current in somewhat the same way at first, the feebleness of response is followed by a greatly exalted susceptibility even to the feeblest currents, and a slow, forcible contraction lasts for some minutes during the time the electrodes are applied. In the normal state the strongest muscular contractions are those produced by cathodal closure—that is to say, when the circuit is formed by the application of the cathodal sponge to the surface, the anodal being already applied; and the energy of the contraction bears a relation to the strength of the currents, which are qualified, as a rule, as *weak*, *medium*, and *strong*. After degeneration of the nerve this is reversed, anodal closure, even with medium currents, being greater than cathodal, and this constitutes the so-called "reaction of degeneration."

When well developed, it may be expressed by the formula (AnSC>CaSC), and there is an increase of the

activity of the muscular response to the cathodal opening, so that it is greater than the anodal opening (CaOC> AnOC). Should the degeneration ultimately go on, the response to the galvanic current will become more and more feeble, and finally disappear altogether. Should there be recovery, however, the muscles at first will respond to an interrupted galvanic current and then to a slowly interrupted induced one, and finally to both currents, as they do in health. When the regeneration of the nerve begins, it will be found that there will usually be a return of the response to both currents at about the same time, and sometimes as early as six weeks after the injury, although the time is usually later. With this there will be a corresponding decrease of the galvanic irritability of the muscles. The diagrams from Erb show these changes, the asterisk indicating the return of motility (see Figs. 25, 26, and 27).

Although this reaction is found in peripheral rheumatic paralysis, which often affects the muscles supplied by the facial nerve, or in lead paralysis, when the extensors of the hand are involved, giving rise to the familiar deformity known as wristdrop, it is characteristic of extensive injury of a nerve trunk. The only other diseases in which it is found are those dependent upon degeneration of the great cells in the anterior horn of the spinal cord—poliomyelitis, and progressive muscular atrophy, and these are manifested by so many other characteristic symptoms that there is hardly room for a mistake.

Peripheral nerve injury is sometimes symptomatized by tremor of the hands and upper extremities especially. This is a species of quivering rather than a rhythmical

tremor or "vermicular contraction," which appears
atrophied muscles. Tonic spasms are also found
or without loss of the pain sense in conjunction wit
tative nerve lesions.

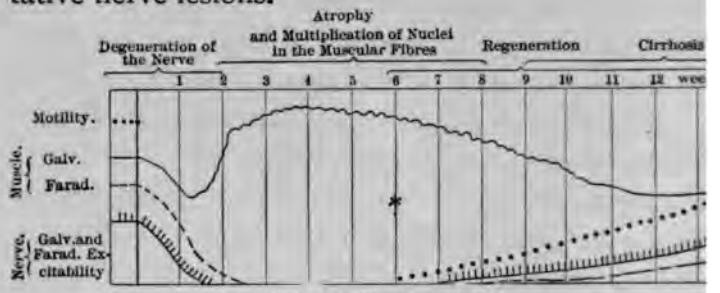


FIG. 25.—Recovery Rapid.

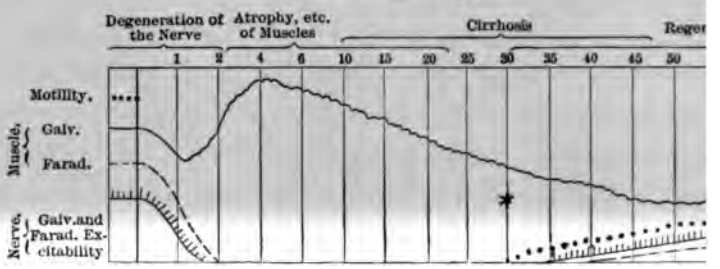


FIG. 26.—Recovery Slow.

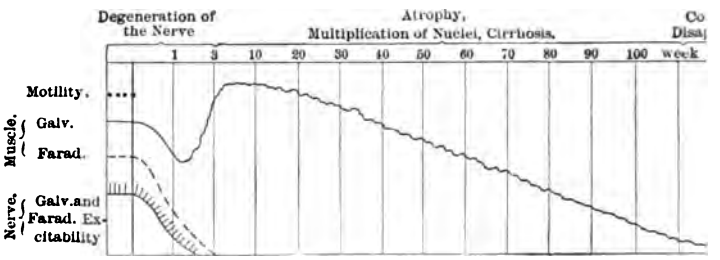


FIG. 27.—No Recovery.

Relation of Motility, Excitability, and Structural Changes in Peripheral P
with Electrical Reaction. (Erb.)

The trophic results of nerve injury, in additic
those enumerated, consist in very conspicuous
motor changes, such as initial determination of
to the surface, with a local elevation of temper

and a subsequent vascular stasis, the surface being livid and mottled, while there is both subjective and objective coldness in all cases. An atrophy of the skin, with a peculiar shininess (glossy skin), crops of herpes, or the appearance of bullæ, which burst, leaving ulcers, is sometimes found, and the latter correspond with the course of the particular nerve; and there may be an associated hyperesthesia. Sometimes the nails undergo a change, becoming brittle or crenated, or are exfoliated; edema is rare. Various grades of sensory disturbances are found with nerve injury, consisting of anesthesia, which may or may not involve the same territory in which motility is deficient, or it may be present in company with hyperesthesia, or the various vague disorders which are included under the head of paresthesia, such as formication, numbness, and ill-defined disturbances of feeling. Pain, either of a neuralgic character or tenderness of the nerve itself, should there be a neuritis, is a familiar and distressing symptom of trauma.

Bowlby is of the opinion that there is little or no shock following an injury to the nerve trunk, although it would appear that such is not the case when there has been a gunshot wound. He attaches little importance to the pain that is caused by the division of a nerve trunk, regarding the loss of muscular power and tactile sensibility as the most important symptoms. In his numerous cases he found the thermic sense lost in proportion to that of touch, but even in examples in which anesthesia was not complete the patients were unable to discriminate between heat and cold.

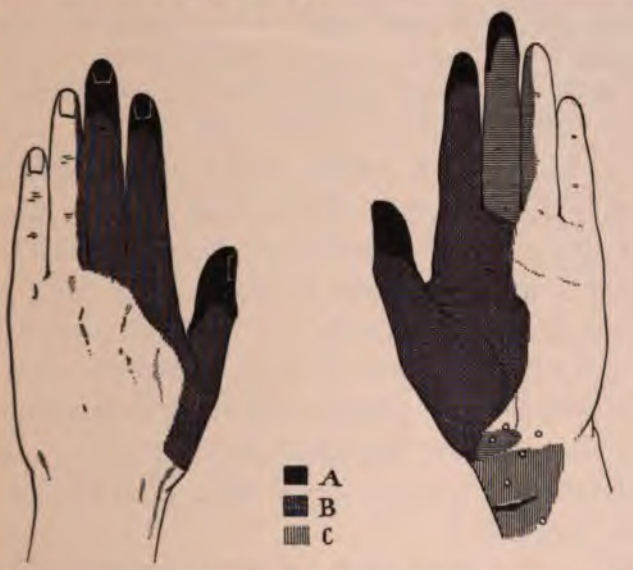
Nerve injury is at times attended by a variety of irregular disturbances, which may be at a different point

from the seat of the lesion. Sometimes they belong to the group known as "reflex paralysis," or, again, there may be a migrating neuritis in association with more or less hysterical dysesthesia elsewhere. Among these cases Vieusse reports one of gradual paralysis of parts supplied by the median and musculo-spiral nerves, following injury at the outer side of the arm, and Cénas a case of reflex trophic changes in both hands, consecutive to an injury to one ulnar nerve. Mitchell refers, among others, to a flesh wound of the thigh which led to a reflex paralysis of all the four extremities. Bowlby groups these cases into two classes, one of which includes the paralyses developing coincident with the injury and the other those in which an interval of time has elapsed.

The following patient with neuritis of the median nerve consulted the writer at the instance of Dr. Corwin, of Bergen Point, N. J., some years ago, and illustrates what has been said:

Case L.—On the 2d of October, 1887, Mrs. S——, a middle-aged woman, attempted to undo a knot with a large pair of scissors with the result that the end of one of the blades ran into her left wrist, making a small punctured wound, at the point marked in Fig. 28. There were slight hemorrhage and some pain, and four days afterward the wound had healed completely; but as a result there was immediate numbness of the entire thumb, with the exception of the distal phalanx, which was completely anesthetic. In a few days the ball of the thumb was numb, but above the wound for an inch or so there was exquisite hyperesthesia, so that the slightest touch caused great agony. For two or three weeks after the receipt of the injury the entire left arm and shoulder were hyperesthetic; but there was no deep tenderness over the nerve trunks, and this soon subsided. It reappeared in the left shoulder about December 23d. About January 6th a twitching of the left arm and hand was first noticed, and has been more or less intense since then. This was hardly a

ıor, but more in the nature of a tic, in which successive ıps of muscular bundles were involved. During the month of ıary crops of herpes appeared upon the back of the arm and ıt the wrist, and the skin of the entire hand and forearm was :y and cold. Toward the latter part of January pain began ıe *right* hand and arm, and subsequently involved the shoul- and there were areas of hyperesthesia on both sides of the



ıs.—Sensory Disturbances due to Wound of the left Radial Nerve. A, Analgesia; , Dysesthesia; C, Hyperesthesia. The spots in right-hand figure are herpes.

y. March 1st, 1888, the patient was seen by the writer, who ıd, in addition to the anesthesia of the left thumb, a dysesthetic dition of the right lower extremity, where some insensitiveness ain existed, and where there was tactile blunting, but no thermo- sthesia. The surface over the cervical spines was exquisitely ler, and there were spots of hyperesthesia over the left shoul- at the angle of the scapula, over the arm and forearm and l on the same side, and some analgesia of the posterior as- of the left hand. The tips of the index and middle fingers anesthetic, and there was some blunting of sensibility, not ınting to complete anesthesia, over the corresponding fingers thumb of the right hand. In the spring of 1888 there had

been no change in the nutrition of the anesthetic parts, although a circular blister, which was applied after the method of Buzzard, was very slow in healing. There was no muscular weakness which could be determined by electrical tests, but some stiffness of the thumb and finger of the left hand which was very noticeable. At this time there was some tremulousness of the entire body which hardly amounted to an emotional tremor. In this case there was undoubtedly injury of the radial nerve, but the other manifestations were clearly hysterical, and the subsequent history of the case has confirmed this diagnosis. The patient's neurotic predisposition and the fact that she was undergoing the menopause were undoubtedly contributing factors.

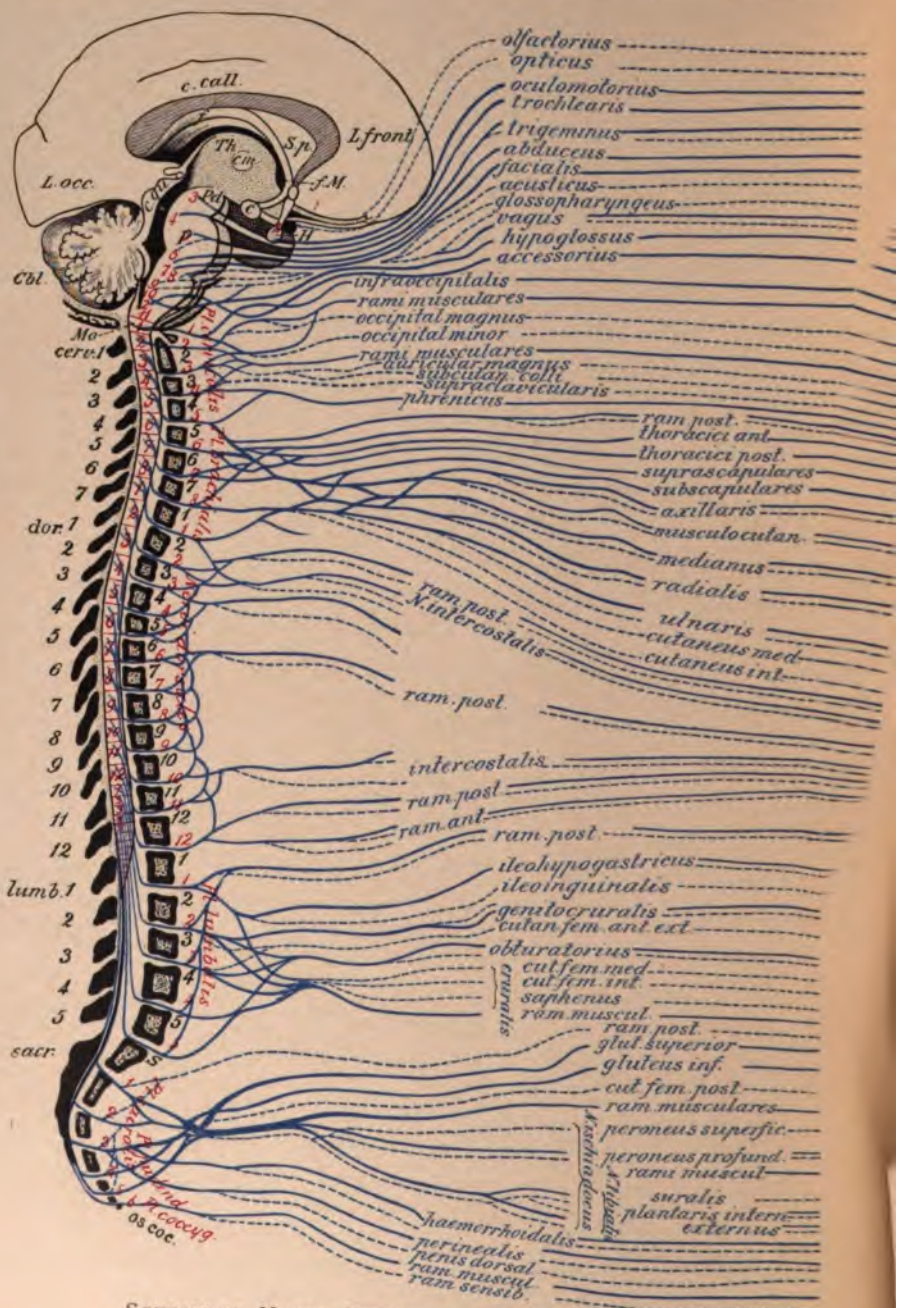
The frequency of special forms of peripheral paralysis naturally depends upon the exposed position of certain nerve trunks and their liability to direct violence through compression, or crushing, or rupture through fractured or dislocated bones. In the cervical region such results are more often due to penetrating wounds, for the nerves of the neck are more deeply seated. The brachial plexus or its branches are susceptible to the effect of a blow to the shoulder, to pressure in the axilla, or at various points in the upper arm.

The lower extremities are seemingly less often the seat of peripheral paralysis. Paralysis of the muscles supplied by the crural nerve is uncommon, unless there be an injury or fracture of the vertebral column or of the pelvis or femur. Sciatic paralysis is also rare as a consequence of injury, and its differentiation from that due to central disease is at times difficult.

The peculiarities of peripheral paralysis have been described by Erb as follows:

1. It is a paralysis of conduction.

2. There is non-participation of branches of the same nerve branching off at a higher plane.



SCHEME OF NERVE DISTRIBUTION. (Jakob.)

"The segments are printed in red. The motor nerves or portions of mixed nerves in solid blue lines. The sensory nerves or sensory portions of mixed nerves in dotted blue lines."

For reference to parts ultimately supplied consult pp. 102–120; 172–174; 218–232.

3. The anesthesia is almost always present, and is precisely limited to the region of distribution of the mixed nerve affected.

4. There is nerve retardation in the conduction of sensation (Weir Mitchell).

5. In addition to the voluntary movements—reflex, automatic, and associated movements are completely absent.

6. Spasms occasioned by central disease do not extend to the paralyzed muscle.

7. Marked vasomotor and trophic disturbances, especially an early and well-marked atrophy of the muscles, indicate peripheral origin.

8. The reaction of degeneration exists in combination with a corresponding sensory disturbance.

For the purposes of diagnosis the following tables are submitted. It must be borne in mind, however, that many forms of lost function may be due to other causes than trauma, and those most likely to follow injury will hereafter be particularized.

SCHEME OF SYMPTOMS OF PERIPHERAL NERVE INJURY.

1. *Motor.* Paralysis or spasm.
2. *Sensory.*
   - (*a*) Pain.
   - (*b*) Loss of sense of touch.
   - (*c*) Loss of muscular sense.
   - (*d*) Loss of temperature.
   - (*e*) Analgesia.
   - (*f*) Abnormal sensations.
     - Burning.
     - Tingling.
     - Pricking.
     - Numbness.

3. *Trophic.*
   (*a*) Atrophy of muscles.
   (*b*) Atrophy or hypertrophy of connective tissue.
   (*c*) Changes in the skin in color, texture, and consistence, as shown by the "glossy skin"; ulcers, whitlows, and gangrenous conditions; eruptions, which may be herpetic or bullous.
   (*d*) Changes in the nails in texture and contour, as shown by the ridging, and thickening, and curving, longitudinally and transversely.
   (*e*) Loss of hair (several writers report cases in which there was an excessive growth).
   (*f*) Changes in joints which may be ankylosed.
   (*g*) Bony changes; loss of weight (rarely found).
4. *Vasomotor.*
   Increased temperature of the part, hyperemia, and occasional edema, followed by subnormal temperature and cyanosis.
   The temperature is usually lowered over the anesthetic area (Bowlby).
   Diminished sweating over affected areas.
5. *Deformity* (occasionally), such as
   (*a*) Wrist-drop, when musculo-spiral nerve is paralyzed.
   (*b*) Wing-like scapula; postthoracic nerve paralysis.
   (*c*) Claw hand in ulnar nerve paralysis.
   (*d*) Foot-drop in anterior tibial nerve paralysis.
   (*e*) Calcaneus in posterior tibial nerve paralysis.
6. *Electrical Reaction.*
   (*a*) Reaction of degeneration when nerve has been completely severed or crushed.
   (*b*) Quantitative changes when nerve has been injured by compression.

Cervical Nerves (Eight pairs).

Anterior and Posterior Divisions.

Anterior divisions of first, second, third, and fourth in the formation of the cervical plexus.

Anterior divisions of fifth, sixth, seventh, and eighth assist in the formation of the brachial plexus.

Posterior divisions, muscular and cutaneous.

Muscular.

Rectus capitis, anticus major and minor, and lateralis.
Superior and inferior oblique.
Complexus.
Transversalis colli.
Trachelo-mastoid.
Cervical ascendens.
Spinalis colli.
Supraspinalis.
Interspinalis.
Multifidus spinæ.
Splenius.
Semispinalis colli.

Cutaneous supply integument, covering head and neck.

These muscles assist in maintaining the head in upright position, and flex and extend, and also rotate it. They are rarely involved in traumatic paralysis, which, if it occurs, is combined.

Spasm, unilateral or bilateral.

CERVICAL PLEXUS.

Principal nerves.
- Occipitalis minor.
- Auricularis magnus.
- Superficialis colli.
- Phrenic.

The first three nerves are chiefly sensory, supplying the integument over side of the neck, head, face, and ear—injury or disease depressed by cervico-occipital neuralgia, etc.

PHRENIC—muscular and visceral.

Muscle—Diaphragm.

Viscera.
- Pleura.
- Pericardium.
- Peritoneum.

Motor Symptoms.

Paralysis—unilateral or bilateral.
Spasm—tonic or clonic (hiccough).

Sensory.

Pain over scalenus anticus with tender points.
Neuralgia of pleura, pericardium, and peritoneum.

Symptoms.

Rapid respiration; depression of epigastrium on ins
ation; dyspnea on exertion; constipation.

Hiccough and occasionally cyanosis; electrical reac
usually unchanged.

DORSAL NERVES (Twelve Pairs).

ANTERIOR DIVISION, muscular, cutaneous, and visceral.

POSTERIOR DIVISION, muscular and cutaneous.

ANTERIOR, called *intercostal nerves.*

First assists in formation of brachial plexus (sympath
branch to eye passes through it—Klumpke).

Second, Third, Fourth, Fifth, Sixth } supply (*a*) { Internal and external intercostal
Infracostales.
Triangularis sterni.
Levatores costarum.

(*b*) Pleura and lungs.

(*c*) Integument covering anterior che

Seventh, Eighth, Ninth, Tenth, Eleventh } supply (*a*) { Internal and external lower i
costals.
External oblique.
Transversalis.
Rectus.
Serratus posticus inferior.

(*b*) Abdominal parietes.

(*c*) Integument over abdomen.

Twelfth assists in formation of dorso-lumbar cord.

These intercostal nerves are rarely subject to decided paralysis, but to sensory (intercostal neuralgia).

Trophic Changes. Herpes zoster, etc.

POSTERIOR DIVISION, muscular and cutaneous.

Muscular.

Erector spinæ.
Spinalis dorsi.
Semispinalis dorsi.
Rotatores spinæ.
Supraspinalis.
Interspinalis.
Intertransversalis.
Multifidus spinæ.

Sensory.
Anesthesia of radial side of forearm, back and fron

Trophic.
There may be stiffness in elbow-joint.

SUPRASCAPULAR (fifth and sixth cervical).

Muscular.
Supraspinatus
Infraspinatus.

Articular.
Shoulder-joint.

Motor.
Inability to rotate humerus outward.

Sensory.
Anesthesia over scapula.

CIRCUMFLEX (fifth, sixth, seventh, and eighth cervical).

Muscular.
Deltoid.
Teres minor.
Triceps.

Cutaneous.
Integument of shoulder.

Articular.
Shou
joi

Motor Symptoms.
Inability to raise arm.
Limited abduction.

Sensory.
There may or not be anesthesia of the skin coverin
shoulder.

Trophic.
Adhesions; ankylosis of shoulder-joint; atrophy of toid, causing flattening of the shoulder.

Electrical reactions vary with amount of injury.

MUSCULO-SPIRAL (fifth, sixth, seventh, and eighth cervical).

Muscular.
Triceps.
Anconeus.
Supinator longus and brevis.
Extensor carpi radialis longus.
Brachialis anticus.
Extensor of fingers.

Cutaneous.
Integument of ra
side of back
hand, back
thumb,
finger, an
of middle

Motor.
Inability to extend and supinate forearm.
Inability to extend wrist, fingers, and thumb.
Inability to adduct or abduct fingers perfectly.
Inability to extend distal phalanges.

Sensory.

Numbness and tingling of radial side of forearm, hand, back, and outer side of arm.

Deformity. Characteristic "wrist-drop."

Electrical Reactions. Reaction of degeneration.

Trophic.

Atrophy and nodular enlargement in extensor tendon sheaths; also prominence of carpal bones.

EDIAN.

Muscular.

Pronators.
Flexor carpi radialis.
Flexor of finger.
lexing and adducting thumb.
adialis lumbricales.

Cutaneous.

Radial side of palm, front of thumb of first two fingers, half of third finger.

Motor.

Inability to flex radial side of wrist.
Inability to flex second phalanges on first.
Inability to flex distal phalanges of first and second fingers.

Sensory.

Anesthesia in palmar surface of thumb, index, and middle fingers.
Anesthesia in radial half of ring finger.
Anesthesia in radial half of palm.
Anesthesia on dorsal surface of index finger.

Trophic.

Very marked; glossy skin and curved ridged nails; affecting ring and little fingers as well as those supplied by median nerve (Bowlby).
Hair absent; also perspiration.

Deformity.

Forearm atrophied.
Wrist bent to ulnar side.
Flattening of ball of thumb.
Thumb extended and adducted.

Electrical reactions vary; usually there is reaction of degeneration.

NAR (eighth cervical and first dorsal).

Muscular.	*Cutaneous.*	*Articular.*
Flexor carpi ulnaris.	Anterior and posterior surface of little finger.	Wrist.
Flexor profundus digitorum.		
Flexor brevis pollicis.		
Ulnar lumbricales.	Same of ulnar side of ring finger.	
Interossei.		
Abductor minimi digiti.	Same of ulnar side of hand extending to wrist.	
Opponens minimi digiti.		
Flexor brevis minimi digiti.		

Motor.

Inability completely to flex ring and little fingers. The proximal phalanges are hyperextended upon metacarpal bones, due to paralysis of interossei; second and third phalanges are flexed on account of paralysis of interossei.

Deformities.

Heads of metacarpal bones are prominent in palm of hand, and the extensors are prominent on dorsal surface, due to hyperextension of proximal phalanges; hand drawn to radial side. Adduction of thumb impossible, also all movements of little finger. Hypothenar eminence disappears; palm is hollow, and there is a slight rotation of thumb.

Sensory.

There is usually loss of sensation of touch, pain, and temperature sense of anterior and posterior surfaces of little finger, ulnar side of the ring finger, and most of ulnar side of the hand.

Trophic. Glossy skin, changes in nails, hair, and coldness over anesthetic areas.

Deformity. "Claw hand."

Electrical Reaction. There may or may not be the reaction of degeneration.

Erb's Paralysis (combined paralysis).

Deltoid.
Biceps.
Brachialis anticus.
Infraspinatus (?).
Teres minor (?).
Supinators (?).

Motor.

Arm hangs rotated inward and extended; inability to flex arm (hands and fingers normal).

Sensory. Slight.

Electrical. Reaction of degeneration usually.

Klumpke's Paralysis (first dorsal).

Paralysis of the hand and ocular symptoms. Contraction of pupil, narrowing of palpebral fissure, and retraction of eyeball on the affected side.

LUMBAR NERVES (five pairs).

Anterior and Posterior Divisions.

ANTERIOR, muscular and cutaneous.

First.
Second.
Third. Form lumbar plexus.
Fourth.
Fifth. Forms part of lumbo-sacral cord.

POSTERIOR, muscular and cutaneous.

Muscular.	*Cutaneous.*
Multifidus spinæ.	Integument over gluteal region.
Interspinales.	
Erector spinæ.	
Intertransversalis.	

Motor.

When these muscles are paralyzed, there is an exaggeration of the lumbar curve, the shoulders are thrown back, and the abdomen is protruded.

Sensory disturbance is rare.

ILIO-HYPOGASTRIC, muscular and cutaneous.

Muscular.	*Cutaneous.*
Transversalis.	Skin over gluteal region.
Internal oblique.	Skin over hypogastric.

Motor paralysis incomplete, as these muscles are also supplied by lower intercostal nerves.

Sensory more marked. Lumbo-abdominal neuralgia; pain in the loins, back, buttocks, and hypogastrium.

ILIO-INGUINAL, muscular and cutaneous.

Muscular.	*Cutaneous.*
Internal oblique.	Skin over pubes and genitals; also upper and inner surface of thigh.

Motor paralysis slight.

Sensory.

Pain over pubes and external genitals. There may be neuralgia of one testicle—"irritable testicle" of Cooper. Pain or anesthesia over inner and upper part of the thigh. Neuralgia radiating down the thigh.

GENITO-CRURAL, muscular and cutaneous.

Muscular.	*Cutaneous.*
Cremaster.	Skin over thigh as far as half to the knee.

Motor. Drawing up testicle.

Sensory.

Pain over anterior surface of the thigh.

OBTURATOR, muscular, cutaneous, and articular.

Muscular.	*Cutaneous.*	*Articular.*
Obturator externus.	Inner side of thigh and leg.	Hip and knee.
Adductors.		
Gracilis.		
Pectineus.		

Motor.

Inability to adduct thigh.

Inability to press knees together

Inability to cross leg.

Flexion and inward rotation are difficult; so is outward rotation.

Sensory.

Pain or anesthesia along inner side of the thigh as far as the knee.

ANTERIOR CRURAL, muscular, cutaneous, and articular.

Muscular.	*Cutaneous.*	*Articular.*
Iliacus and psoas.	Inner side of thigh, leg, and foot.	Hip joint.
Sartorius.		
Rectus.		

Obturator internus.
Gemelli.
Quadratus femoris.

Motor.

Impaired outward rotation of thigh.
Impaired abduction.

But as other muscles assist in these motions, outward rotation and abduction are imperfectly performed.

PUDIC NERVES, muscular and cutaneous.

Muscular.	*Cutaneous.*
Transversalis perinæi.	Skin over scrotum, inner side of penis, glans penis, prepuce.
Accelerator urinarius.	
Erectores penis.	
Compressores urethræ.	

Motor.

Vesical spasm, priapism.
Incontinence of urine.

Sensory.

Pain; neuralgia of penis.

GLUTEAL NERVES (superior and inferior).

Muscular.	*Cutaneous.*
Glutei.	Skin over buttocks.
Tensor vaginæ femoris.	

Motor.

Inability to rotate leg outward and inward.
Flexion interfered with.
Uncertainty in standing, balancing, and ascending stairs; loss of abduction and circumduction.

Sensory.

Anesthesia of gluteal region.

Trophic.

Atrophy of glutei, bedsores, ulcers.

Deformity.

Flattening of buttocks.

Electrical reactions vary.

SMALL SCIATIC NERVE, muscular and cutaneous.

Muscular.	*Cutaneous.*
Gluteus maximus.	Integument over perineum and back part of thigh and leg.

Motor.

Paralysis of gluteus maximus, shown by difficulty in rising from a sitting position and in going upstairs or uphill.

Sensory.

Anesthesia of the skin of the middle third of the back of thigh and upper half of calf.

Trophic.

Atrophy of buttocks, bedsores, ulcers, etc.

GREAT SCIATIC NERVE, muscular, cutaneous, and articular.

Muscular distribution.

Biceps.
Semitendinosus.
Semimembranosus.
Adductor magnus.
Flexors of leg and foot } by terminal branches.
Extensors of leg and foot }

Cutaneous distribution.

Integument of whole leg (including terminal branches).

Articular distribution.

Hip-joint.
Knee-joint.
Ankle-joint (including terminal branches).

Motor Symptoms.

Extent of paralysis depends upon location of lesion. When near the sciatic notch, the flexors of the leg and all the muscles below the knee are paralyzed, and there is complete inability to extend hip, flex leg, or flex and extend foot.

If lesion is below upper third of thigh, flexors of leg escape paralysis.

Sensory Symptoms.

These also depend upon location of lesion. When in perineal region, anesthesia in anterior and external side of leg, dorsum of foot, and greater part of toes. In tibial region, anesthesia over posterior surface of leg, sole of foot, and plantar surface of toes. If in the cavity of the sacrum, anesthesia of scrotum and penis, urethra, bladder, and rectum.

Vasomotor.

Cyanosis and coldness over affected areas.

Trophic.

Atrophy of paralyzed muscles.
Eruptions, herpetic or bullous, over affected areas.
Ulcers or gangrene and bedsores.
Paralysis of bladder and rectum when lesion is high [illegible] sacrum.

Electrical Reactions. Usually the reaction of degenerati[illegible]

ANTERIOR TIBIAL (one of the terminal branches of the sciatic)[illegible]

Muscular.	*Cutaneous.*
Tibialis anticus.	Outer half of front of
Extensor hallucis.	Dorsum of foot.
Extensor communis digitorum.	
Peronei.	

Motor.

Inability to flex ankle, abduct or adduct.
Inability to extend first phalanx of toes.
Flexion of first phalanges from action of unoppose[illegible]ed interossei.

Sensory.

Anesthesia over outer half of front of leg and dorsu[illegible] foot.

Trophic.

Slight atrophy.

Vasomotor. Cyanosis and coldness.

Deformity. Talipes, equino-varus or valgus.

Electrical reactions vary.

INTERNAL POPLITEAL (terminal branch of sciatic).

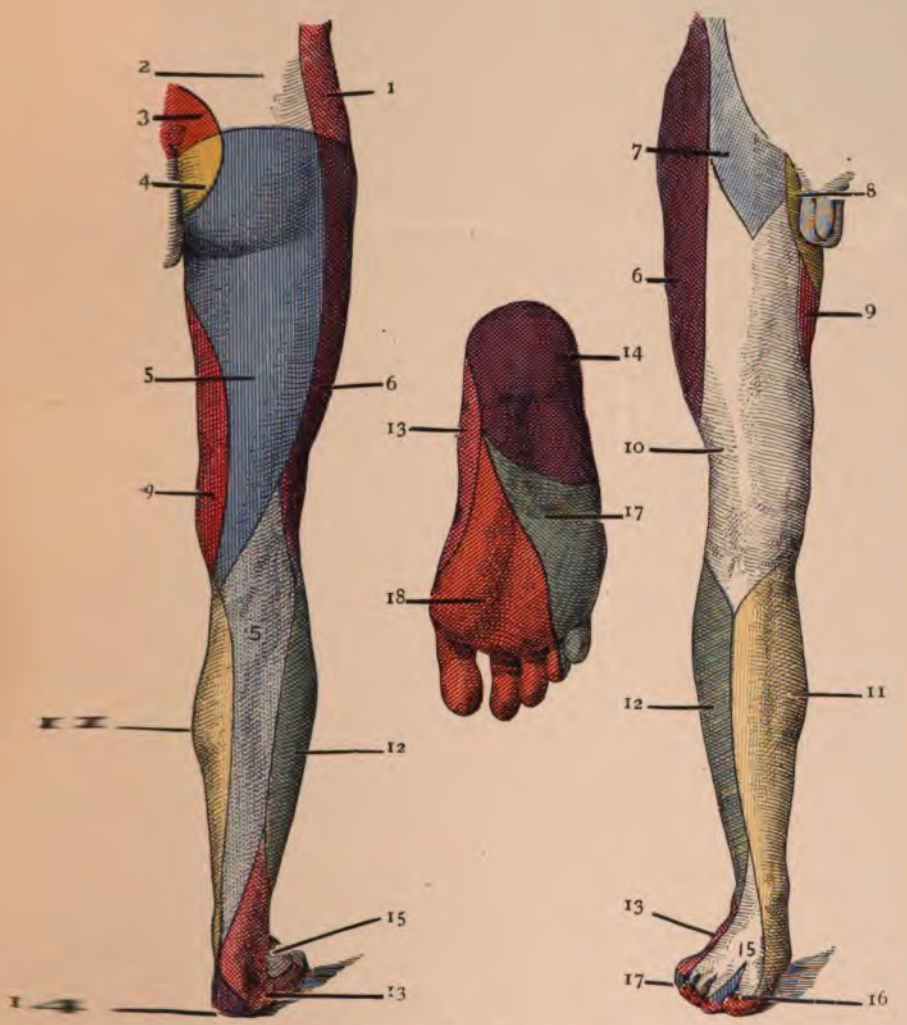
Muscular.	*Cutaneous.*	*Articular.*
Popliteus.	Outer half of back of	Knee-joint.
Soleus.	leg, foot, and fifth	
Gastrocnemius.	toe.	
Plantaris.		

Motor.

Inability to extend ankle; paralysis of calf.
Inward rotation lost.

Sensory.

Anesthesia over lower part of back of leg and of sole vari[illegible]



Lower extremity: 1, Branch of genito-crural; 2, posterior branches of lumbar nerves; 3, posterior branch of sacral nerves; 4, cutaneous branch of coccygeal; 5, lesser sciatic nerve; 6, femoro-cutaneous; 7, crural branch of genito-crural; 8, genital branch of lumbar plexus; 9, obturator; 10, crural; 11, internal saphenous; 12, peroneal cutaneous; 13, external saphenous; 14, calcaneal and plantar branches of posterior tibial; 15, musculo-cutaneous of external popliteal; 16, anterior tibial; 17, external plantar; 18, internal plantar.

POSTERIOR TIBIAL (terminal branch of internal popliteal).

Muscular. Tibialis posticus, flexor longus digitorum, and flexor longus hallucis.

Cutaneous. Heel and inner side of sole of foot.

Motor. Inability to raise inner border of foot; adduction and flexion of distal phalanges and flexion of great toe impossible.

Sensory. Anesthesia of heel and inner side of foot.

INTERNAL PLANTAR (terminal branch of posterior tibial).

Paralysis of short flexors of toes, plantar muscles of great toe (except adductor), and two inner lumbricales.

Anesthesia inner part of sole, plantar surface of three inner toes and half of fourth toe.

EXTERNAL PLANTAR.

Paralysis of flexor accessorius of muscles of little toe, all the interossei, two outer lumbricales, and adductor of great toe.

Anesthesia of skin of outer half of sole, little toe, and half of fourth toe.

Trophic changes in skin and nails.

COCCYGEAL NERVE (1), anterior and posterior.

Supplies coccygeus and integument over same.

Sensory symptoms most common.

Much of the frequency of special forms of peripheral paralysis naturally depends upon the exposed position of certain nerve trunks and their liability to direct violence or crushing, stretching or rupture through fractured or dislocated bone. In the upper extremity, it is found that blows upon the shoulder or over the scapula, or dislocation of the humerus are followed by injuries to the brachial plexus and to such important nerves as the musculo-spiral, circumflex, musculo-cutaneous, and those branches of the cervical that supply the levator and rhomboid muscles of the scapula, giving rise more often to what is known as a *combined or Erb's paralysis*, or again to paralysis of special nerves. Injuries lower down are

apt to affect the ulnar and median nerves, or their peripheral terminations.

The *rhomboid* and *levator anguli scapulæ* muscles, which are supplied by the third and fifth *cervical nerves*, when paralyzed prevent the subject from elevating the scapula without rotation. When the *infraspinatus* and *teres minor*, which are supplied by the suprascapular and circumflex nerves, are paralyzed, there is an inability to rotate the arm outward. Through paralysis of the *subscapularis*, the *teres major*, and *latissimus dorsi*, supplied by the *subscapular* nerve, there is loss of ability to rotate the arm inward, and, by the action of the opponens muscle, the arm is kept in a fixed position.

Paralysis of the *deltoid*, which is supplied by the *circumflex nerve*, prevents the patient from raising his arm laterally or forward. A deformity results from subsequent atrophy, so that what appears to be a subluxation of the head of the humerus is seen. This form is rather common after some injuries of the shoulder-joint, or it may follow a severe blow upon the muscle itself.

Paralysis of the *serratus magnus* may be due to trauma, although other causes, among them a neuritis of the thoracic nerve following pneumonia (Leszynsky) may explain its origin (Fig. 29). Direct injury to the shoulder, which implicates the long thoracic or fifth and sixth cervical nerve, is the most likely cause of this variety. Leszynsky's case presented a double paralysis, which of course would not occur from ordinary injury, giving rise to the well-known wing-like deformity. In this form the lower angle of the scapula is drawn toward the vertebral column, and there is some elevation of the whole bone. The patient cannot raise his arms laterally beyond a hori-

zontal line, unless the bone is passively and forcibly rotated and retained in place, when he can then raise them vertically. There are always associated sensory symptoms, neuralgia or dysesthesia.

In describing Erb's paralysis the terms *upper* and *lower arm types* are used by neurologists to define a form in which there is involvement chiefly of the muscles of the shoulder, or another in which those of the forearm and hand are as well paralyzed. The former is apt to be an obstetrical accident, while the latter is a familiar consequence of trauma that may be received at any time in life. There is always considerable atrophy and the reaction of degeneration occurs.

FIG. 29.—Wing-like Deformity due to Paralysis of Serratus Magnus. (Leszynsky.)

In some cases the diagnosis is difficult, especially when there is a suspicion of poliomyelitis; but in making an examination it will be found that in the latter, which is a disease of the spinal cord, the sensibility will be conserved. With a young child, however, the matter may be different, owing to the difficulty of making a subjective test. Care should be taken to recognize valgus or some lower leg or

foot symptoms, which, if found, will remove doubt as to the central nature of the paralysis.

The *supinator longus*, which is supplied by the musculo-cutaneous nerve, when paralysed, will be manifested by the lost ability to flex the forearm on the arm, and this is seen more fully when the attempt at flexion is made during the supination of the forearm. It is a rare affection by itself, but is usually found as a symptom of the combined brachial-plexus paralysis and as a rule there is some anesthesia of the outer border of the forearm.

Musculo-spiral paralysis is one of the commonest of traumatic forms because of the exposed position of this important nerve. The nature of the loss of function has been elsewhere detailed, but attention may be called to the fact that its extent depends upon the point of compression or injury. If it is in the axilla, or at a high level, the triceps is involved as well as the muscles below; if the lesion be at the middle part of the humerus, this muscle will escape, and if at a lower point the supinator longus will be exempt. The resulting deformity is the familiar "wrist-drop," which is conspicuous and can hardly be mistaken. There is, as a rule, if the position be long maintained, the formation of a hard projection corresponding to the synovial sacs through which the extensor tendons pass, or a hypertrophy of the carpal bones themselves (Fig. 30). We are sometimes called upon to differentiate between traumatic paralysis and that form due to lead poisoning, and cases also present themselves which are examples of simple pressure paralysis due to the use of a crutch or following some form of compression of the nerve by a hard body, or such as occurs when a person sleeps soundly with his arm beneath him, especially if he be in a

A diagnosis was made of injury of the brachial plexus with neuritis. There were early supersensitiveness and weakness, particularly of the flexors, and a diminution of electromuscular irritability, the reaction of degeneration being subsequently found. It does not appear that there was any very great atrophy of the arm even as late as February, 1901. This man received a verdict of $2,500.

Paralysis of the median nerve is uncommon because of its deep and protected position, and unless it be wounded or punctured, or some fracture occurs, it usually escapes and is far more likely to undergo a loss of function as the result of musculo-spiral injury higher up. Besides the paralysis of certain flexor muscles not supplied by the ulnar nerve, it sends branches to the abductors and opponent muscles of the thumb which are commonly involved. If a serious lesion occurs, the pronator teres becomes impotent and it is impossible to pronate the hand, and when the hand is flexed there are deviation to the ulnar side and extension, and adduction of the thumb which cannot be overcome. It is impossible to flex the last phalanges on the others, especially in the index finger. Anesthesia of the radial side of the palmar surface, the ball of the thumb and the dorsal integument, of the tips of the index, ring, and half of the third fingers ought to be looked for, as well as a great deal of atrophy of the thenar muscles.

By all odds the most frequently found traumatic peripheral disorder is that due to injury of the *ulnar* nerve which supplies the important flexors of the hand. As has been said, it is extremely susceptible to violence through direct injury of the elbow-joint, where the nerve is superficial or as a consequence of fracture or dislocation, and is often associated with neuritis and anesthe-

a, more marked on the outer border of the hand (see late).

Sciatic Paralysis.—This, according to Bowlby, commonly follows division of the nerve below the origin of the muscular branches of the hamstring muscles, "and as the extensor muscles are supplied from a different source, the limb retains its mobility on the trunk. In the leg, however, the case is different, the whole of the muscles below the knee and of the foot are paralyzed." The peculiar swinging of the leg and dragging of the toes and the general awkwardness of the body have been compared by Létiévant to the gait of a person with an artificial limb. The loss of sensation is not very great, and there is usually but a slight atrophy.

CHAPTER VII.

EXAMINATION AND THE POSSIBILITY OF ERROR.

THE examination of a plaintiff should not be conducted hastily, or where there are unsuitable or distracting surroundings. It is for this reason that the medical man should object to a hurried meeting during the recess of the court, or at some place where he and the patient are surrounded by a number of others whose presence is unnecessary. There should be no difficulty in arranging an interview at which a medical representative of the plaintiff, the plaintiff himself, and the examiner are alone together. A doctor's office is the best place for this, and preferably one supplied with the ordinary facilities and apparatus for diagnosis. Delicate electrical examinations are apt to be unsatisfactory if rough, portable apparatus only is available, and an investigation of the patient's subjective symptoms is not possible in a lawyer's office or in the corner of a court room. The same objection should be made to a dimly lighted and crowded room, perhaps in a tenement-house, in fact any place is objectionable where a crowd of sympathetic and officious bystanders are ready, not only to correct the patient in his statements, but to put words in his mouth. In this connection, especially when the inquiry is directed to the determination of subjective complaints, it is of the gravest importance that the questions should in no sense be leading or suggestive; but at the same time the utmost fairness

should be shown the patient, and he should be given ample opportunity to detail and explain his symptoms in his own way. The interposition of officious persons is to be prevented, for if the subject really suffers he is ordinarily able to tell his own troubles. Discussions and arguments with the physician or others in the room do little or no good, and often lead to undignified controversy and possibly subsequent misrepresentation. The examiner is supposed to be qualified to make an independent and personal investigation, and should be allowed to do it unmolested. He, however, should listen to medical information and, if it be germane to the case, give it full weight. It is usually unnecessary even in doubtful cases to subject the patient to harsh or painful tests, or, if he is thought to be imposing, to berate him or accuse him of fraud, for there are other ways to do this, with which most people possessed of common sense and an insight into human nature are familiar. A preliminary inspection of the subject, even though a hurried one, must impress the experienced observer with the reality or unreality of the patient's condition. Well-known disturbances of motility may be observed in the gait or in the execution of required muscular movements, and there is a consistency in the expressions of a real sufferer which cannot be mistaken. The chief thing to be remembered is that the unconscious acts are those chiefly to be taken into consideration, and that the objective expressions are of far greater importance than the complaints.

In examining the alleged muscular weakness, if there is nothing to confirm the subject's claim that he has lost power, the dynamometer—either the instrument proper for testing the hand grip, or that for the lower

extremities—may be utilized (Fig. 31). If the form
be used, the truly akinetic subject will make sever
attempts, the first forcing the needle to a greater poi
forward than those which follow, thus indicating t
continuous exhaustion by repeated efforts, while the i
postor may either make no attempt at all, or will ma
pressure so irregularly as to suggest deception. If he
blindfolded, the deception can be easily recognized. A
has been shown, well-known changes take place, not on
in the muscle cut off from its central point of innerv

FIG. 31.—Mathieu's Dynamometer.

tion, but with other kinds of cerebro-spinal disease the
are variations in the response to electric stimulatio
Under some circumstances when these cases become th
subject of litigation, the popular idea of an electrical te
implies that the injured person should stand a severe ar
painful application without flinching. While this may
true when hysterical or other anesthesia exists, there a
many serious conditions in which it has nothing to do wi
the patient's real state. The use of electricity after all
of the greatest moment in peripheral or other paraly
where the reaction of degeneration is found, but ev
here there has been an inexcusable misconception in
gard to what should constitute such a reaction; in a
cent case a medical gentleman, who qualified as an exp

in electrotherapeutics, stated that the sensibility of the muscles to the stimulation of the *induced* current was at once *increased*.

Unless an electrical examination be properly and carefully made, it is indeed useless. Not only should the electrodes and the "make-and-break" handle be suitable, but the physician should rely upon a milliampère-meter, and not compute the strength of the current by the number of cells used, as was the old custom. While it is possible to approximate the voltage in this manner, there is no way of accurately estimating the quantity of the current. With this instrument it is not only within our power to make comparative calculations, but its reading will be final and accurate. To make proper tests a knowledge of the *motor points* which have been mapped out by Erb should be borne in mind, and the electrodes should not be applied indiscriminately as they so often are.

A slipshod use of electricity for the purpose of diagnosis can be of absolutely no value, and should not be given weight in a court of law. Not only is it necessary, in some cases, to have good conduction, but allowance should always be made for the dryness and thickness of the skin, which may as well interfere with a test of the condition of the reflexes.

The two kinds of reflexes that interest us are the *superficial* and the *deep*. The superficial is evoked by irritation of the skin, when there will be a resulting muscular contraction, usually of light grade. There are several places where this may be evoked, the *plantar* surface being the most familiar. Changes in the superficial reflexes are of interest when they are associated with some anesthetic condition of the skin, or in states of unconsciousness when

they are usually absent. The tendinous reflexes depend upon the normal condition of a functionating spinal arc formed by the central neurone, by afferent and efferent nerves, and by tendon or muscle.

The knee-jerk is probably that which is most often looked for, and its absence or exaggeration has a bearing upon many central or superficial conditions of disease.[1] It is best tested by making the patient sit upon a high chair or table, his legs hanging limply, and tapping the patellar tendon with a rubber-headed hammer, a steel sound, or an ordinary ruler, which are all preferable to the hand. The result will be a contraction of the quadriceps and other muscles and a resulting kick of more or less vigor. If the common way of testing this reflex is tried, that is, by making the patient cross his legs, it will often be found that in fat people there will be no response. When it is not possible to seat the patient in the manner suggested, he may be made to hang a leg at a time over the rigid forearm of the examiner. Sometimes a tap over the head of the fibula will produce a response.

If the patient is not blindfolded, the method of *reinforcement* (which consists in causing him to attempt some other voluntary action at the same time) is recommended. He should be directed to look upward, while he locks the fingers of one hand with those of the other and pulls without relaxing his hold; sometimes when the knee-jerk is not evoked by the ordinary tap, it will follow this procedure. Enough has been said about the significance of diminished or increased reflexes, but it may be further

[1] The deep reflexes are the pupillary, elbow or triceps, knee-jerk, and ankle clonus. The superficial reflexes are the abdominal, cremasteric, gluteal, and plantar. Others of minor importance are the wrist and jaw reflexes, which are deep.

ated that in about one in five hundred normal persons
e knee-jerk is absent.

In investigating sensory changes, especially anesthesia,
ere are certain things which sometimes seriously inter-
re with the accomplishment of satisfactory results. A
tient should always be examined, if possible, in a room
comfortable temperature, and the condition of the skin
elf should be observed, for certain individuals are natu-
ly insensitive, and of course perception is not so acute
some parts of the surface as in others. I have found
at the contact of certain underwear has often produced
appreciable amount of more or less insensitiveness,
pecially over the anterior part of the thigh and leg, and
other people the plantar or palmar surfaces are thick-
ned, and materially interfere with the delicacy of tactile
sts.

Laboring men and women, especially those whose
ands are kept in liquids which indurate the tissues, are
ften insusceptible to impressions which could readily be
erceived by others. The esthesiometer (page 62) is an
strument which is not always exact and, as subjects are
ften inclined to guess, saying they feel three or four
oints instead of one or two, it is not only wise to make
great many tests, but to avail ourselves of certain means
f detecting in a more definite manner the integrity of
is kind of sensation. To accomplish this we may draw
ith a pointed instrument geometrical figures upon the
rface, or follow the plan of Rumpf, which consists of
aking letters, their perceived magnitude determining
e degree of sensibility. The sizes by which they can be
cognized by the normal individual vary from one-fifth
f an inch in height upon the finger tips to one and one-

fifth inches in the calf and sole. Other tests to gauge the quickness of transmitted peripheral stimulation should be utilized, for in certain central diseases there is an appreciable retardation. The normal reaction time is considerably less than half a second, but in disease an interval of several seconds may elapse before it is felt. An amplication of this test that necessitates the use of complicated apparatus may be employed not only to determine accurately the quickness and extent of certain partly or wholly involuntary functions, but to approximate the general intellectual activity.

In making thermic tests the temperature of the applied substance should be sufficiently extreme, for a normal person cannot distinguish heat and cold as such when the test objects are at a temperature between 80.6 and 86° F. (Dana). It also makes a difference as to the size of the object which is brought in contact with the skin, a small surface being more quickly and keenly appreciated than a large one. If test tubes be employed at least four should be at hand, two respectively containing warm and hot water, and the others cold and iced water if possible. The test thus amplified, especially if the subject be blindfolded, prevents deception.

In testing tactile anesthesia great care must be exercised lest there be vibration or agitation conveyed to healthy parts in the vicinity, and Létiévant speaks of the patient's ability to "discern friction on an anesthetic surface by means of vibrations carried by the tissues to corresponding healthy nerves." Bowlby, in referring to this, says that the likelihood of mistake is naturally great, especially in anesthesia of the fingers, when a false perception of touch occurs, especially when one

inger is supplied by both the median and the ulnar nerves.

In investigating the alleged pain of individuals who submit to examination we are not to lose sight of the existence of what are known as *referred* pains, and that these are sometimes found in connection with disease of certain organs and bear no necessary correspondence with the exact site of the morbid process itself. They are alluded to here because of the possibility of confusion with trauma. They arise not only from organic conditions, but from functional as well, and are most eccentric and irregular, owing their creation to irritation of visceral nerves and of the general sympathetic system. "Irritation sent into the spinal cord through these nerves sets up sensory impulses in the various segments of the cord, each segment receiving impulses from a certain organ. These sensory impulses are sent upward to the brain and become conscious perceptions. They are referred by consciousness, not to their actual point of origin, but to the part of the body from which sensations usually come when received at the particular segment irritated. Thus, as in general experiences, sensations and pains coming from the various segments of the spinal cord have been due to irritation in the surface of the body corresponding to these segments; these various visceral sensations are referred to the surface of the body" (Starr). Among these referred pains may be mentioned the frontal and suboccipital headache, due to eye strain; the temporal or postaural pain, due to the existence of carious teeth, in which there is no local discomfort. The illustration on page 247 shows some of these various irregular areas of reflected pain in connection with various visceral and functional diseases. In addi-

tion, we find that with gastric disorders there are localiz
pains in the middorsal region, with hepatic disturban
there is the familiar pain below the right shoulder, ar
some lumbar pain in association with uterine disorde
The author has availed himself of Dana's excellent di
grams, which indicate the area, cerebro-spinal nerves i
volved, with their distribution; the associated ganglia
the sympathetic, as well as the parts supplied by the la
ter. These are considered, so far as the parts include
in Fig. 32 are concerned.

It is best to test tremor by the myographium, but th
ordinary sphygmograph has been utilized as a diagno
tic aid, it being fastened to a table while the patient hold
the lever between his thumb and forefinger. This is a
best but a rough test, and it is impossible to get chron
logical tracings at the same time which are sufficiently a
curate. Besides this the mental effort required to kee
the style from leaving the limits of the surface of the pap
must cause more or less mental influence which to so
degree inhibits the tremor. A crude test consists
making the subject spread his fingers, meanwhile brin
ing the thumbs together. Intention tremor, which is th
evoked or increased by attempting some more or less d
cate act, may be tested by asking him to carry a full g
of water to the mouth, and as it is often associated
speech disturbance, as in multiple sclerosis, the person
afterward be made to repeat certain words involving
use of special muscles of the organs of articulation,
read, when "scanning" may be recognized. This i
ally connected with a peculiar pause after the enunc
of each syllable. Besides these tests, others should
ployed, when we may find *static ataxia*—that is

that loss of co-ordinating power and sense of direction when the patient tries to stand with his eyes closed; or *locomotor ataxia*, which consists in the expression of disorderly gait or other defects of co-ordination when he attempts to walk

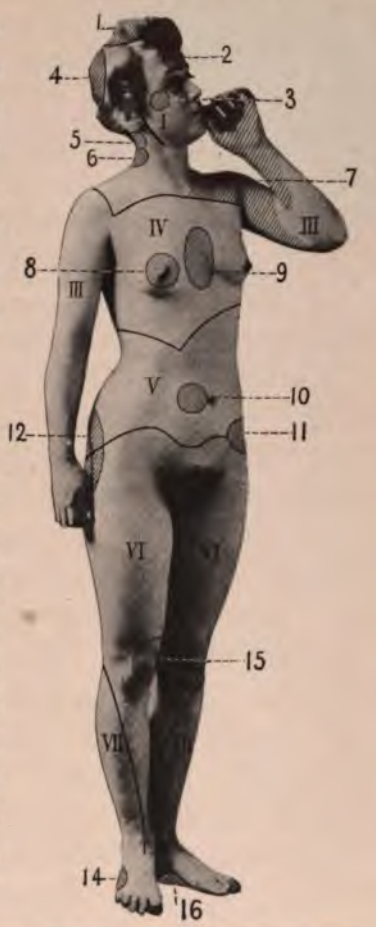


FIG. 32.—Referred Pains. (Modified from Dana.)

Suggestive of (1) anemia, endometritis, bladder; (2) errors of refraction, gastric dyspepsia; (3) decayed teeth, eye-strain; (4) liver; (5) otitis media, eye-strain, pharyngitis; (6) neurasthenia with spinal ischemia; (7) cardiac neurosis and organic disease, sometimes; (8) uterine; (9) pseudo-angina pectoris or gastric neuralgia; (10) bladder or, more rarely, penis; (11) spasm of ureter, ovary; (12) broad ligament, ovaries; (14, 16) gout, neurasthenia; (15) hip-joint disease. Besides these there are a dorsal point connected with gastric disease, a lumbar area in which is located the backache of uterine disease, and two limited spots corresponding with the liver and spleen. 2 and 5 are often conjointly affected and may be the seat of paroxysmal pain when exceedingly hot or cold substances are ingested.

The areas, nerve supply, and sympathetic ganglia associated with distribution have been thus tabulated by Dana:

Area.	Cerebro-Spinal Nerves.	Distribution.	Associated Ganglia of Sympathetic.	Distribution.
I.	Trigeminus, facial.	Face and anterior scalp.	Fourth cerebral.	Head.
II.	Upper fourth cervical.	Occiput, neck.	First cervical.	Head, ear.
III.	Lower fourth cervical and first dorsal.	Upper extremity.	Second and third cervical, first dorsal.	Heart.
IV.	Upper sixth dorsal.	Thorax.	First to sixth dorsal.	Lungs.
V.	Lower sixth dorsal.	Abdomen, upper lumbar.	Sixth to twelfth dorsal.	Viscera of abdomen and testes.
VI.	Twelfth dorsal and fourth lumbar.	Lumbar region, upper gluteal, anterior and inner thigh and knee.	First to fifth lumbar.	Pelvic organs.
VII.	Fifth lumbar and fifth sacral.	Lower gluteal, posterior thigh and leg.	First to fifth sacral.	Pelvic organs and legs.

or perform suggested actions. In certain degenerative diseases such as tabes, these difficulties of movement are found, as well as a loss of the muscular sense, which interferes to a great degree with the subject's muscular appreciation of the passive relationship of his limbs.

Suggestions have been made elsewhere that certain substances be used to determine the acuteness of smell and taste, and care should be taken, for, strange as it may seem, the exact appreciation of these functions is often misunderstood and improperly localized. Loss of smell is harder to test than that of taste, through the error of confusion and the difficulty of stimulating one olfactory nerve and not the other at the same time. If the olefactometer is not available, a number of small slender phials may be, which should be tightly corked and kept apart when not in use, each containing some familiar odoriferous substance, such as oil of rose, turpentine, asafetida, oil of cloves; and these, in solutions of different strength, should be tried one after the other. Diffusible or pungent volatile substances confuse the results and are not recommended. It is unnecessary to repeat what has been said about the tests of vision and hearing, except to urge the importance of always freely dilating the pupils, not only for the recognition of old iritis but to secure a proper ophthalmoscopic examination of the fundus. Before doing this the patient's permission must be obtained and he must be informed in the presence of others that he may suffer temporary discomfort, otherwise the examiner may be subsequently berated for torturing the plaintiff, even if an actual aggravation of the condition is not claimed; this has occurred. In several cases with which the writer is familiar, the Roentgen rays have been

utilized to depict the injured condition of the skull and vertebral column in certain litigated cases, in which fracture of the head and spine is said to have occurred, and sometimes with fair success. The value of the *x*-rays is greater, however, in showing the existence of a foreign body embedded in the brain than in demonstrating fracture, and it is only when considerable displacement or very great depression of bone exists that it is of avail. The case is different in spinal injuries, fractures and dislocations, especially in the neck, for here excellent skiagraphs are possible and made without trouble. The matter of obtaining a picture which shows an antero-posterior deformity is more difficult and implies the exercise of great care. It is doubtful whether, in incomplete fractures or in those without much displacement of the various processes, any striking change can be detected. The exact location of a bullet or any other foreign body in the skull necessitates the making of two separate negatives, one at right angles to the other, and for this purpose we may adopt the method of Walsh, which is depicted in Fig. 33. "Two views are taken by shifting the focus tube, but the body to be penetrated and the sensitive plate remain in exactly the same relative positions. The lamp is put at the same distance from the plate in both views, and also in some known relation to a given point, say the centre or the edge of the plate. By comparing the resulting shadows, a conclusion can be formed as to the intersection of the planes (No. I. *a*., No. II., *b*). It need hardly be said that two plates must be used, one for each position."

At best skiagraphs should be received with great caution, but it does not do absolutely to ignore their value, for they may show a gross bony lesion or deformity or a

foreign body, though the rest of the picture conveys but little. In a case of this kind a very positive young man on the witness stand claimed that these appearances did not exist in a very clear case, when they were patent to

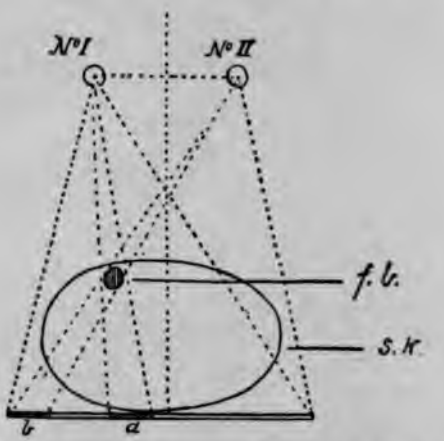


FIG. 33.—Verifying Method of making a Skiagraph of the Head. (Walsh.)
f. b., Foreign body; *SK*, skull.

every one, but the only anomalies he admitted w
"exaggerated depressions corresponding to the situat
of the Pacchionian bodies!"

CHAPTER VIII.

PROGNOSIS IN RELATION TO THE VERDICT.

In the determination of the extent of injury and its bearing upon the future life of the individual, there are several medical considerations to be taken into account beside those which are purely legal and pertain to the matter of contributory negligence. These consist in the recognition of the incapacitating influence of secondary and induced disease, as well as the prognosis of affections which under other circumstances might be non-traumatic; the question whether the subject has sought or received appropriate or sufficient medical or surgical attention arises, or whether a possible tardy recovery or permanent disability may be due to malpractice or to the patient's own neglect. Additional subjects of inquiry are the pre-existence of other contributing illnesses, either proximate or remote, or again, possibly an hereditary predisposition may give the traumatic affection an entirely different complexion. Again, in some cases when the bacilli of tuberculosis or the micro-organisms of other affections are introduced into the system through wounds of the body made perhaps through the defendant's admitted neglect, a new phase of responsibility is to be considered which of late has given rise to a great deal of discussion. Sometimes the initial injury may be exceedingly trivial, yet the recipient may succumb to the grave, implanted disease; or still again an injury with no immediate infec-

tion may occur in a subject who later dies from tuberculosis, the bacilli being taken into the body long after the accident in the ordinary way. In this connection, attention may be called to the possibility of a complicating tetanus or erysipelas with the development of which the defendant has little to do, yet so far as the responsibility is concerned the court has very strong ideas.

If infectious micro-organisms produce disease through introduction into the circulating blood even through a trivial wound, it has been held in the Wisconsin courts that the injury and the disease are both elements of damage in actions for negligence. McDill has insisted upon the importance, therefore, upon the part of the railway surgeon that he should keep careful and accurate and minute records of all cases of slight injury "with careful anamnesis extending over the entire period from infection of the trauma to the disappearance of the last vestiges of its results. When an action for damages is contemplated, medical experts should remember that these infectious diseases do not usually follow injuries, and that, therefore, the disease must, in order to constitute an element of damage, be clearly traced to the injury, either immediately, or by an unbroken chain or succession of events, reaching from the injury to the disease and producing it. . . . It should be further borne in mind that the effects of slight injuries upon most tissues are generally rapidly effaced by physiological processes, and if an infectious complication should arise therefrom it should follow soon thereafter, and would be expected to pursue an acute course."

It would be almost impossible to fix any arbitrary rule

by which compensation could be fixed for injuries and their consequences which incapacitate partially or fully. In this country a medical man is not permitted to express any opinion except of the vaguest kind, while the records of the German insurance system, to which allusion has already been made, approximate the percentages of compensation for various forms of disability. The widely differing direct effects and the progress of spinal and head injuries with complications, must impress even the skilled observer with a futility of an infallible prognosis. The local law compels us to fix "with reasonable certainty" the patient's future condition, and this is very liberal; but it cannot be gainsaid that many medical experts are prone to take too light a view of certain trauma and too severe a one of others, and it is here where experience and observation become of value.[1]

What has been said of the prognosis of special conditions need not be repeated, except that many diseases of the cerebral cortex and basal and central parts, especially where there is infection, are often apt to be very grave, and if not fatal, their course is slow; that fractures of the upper part of the spinal column and of the base of the skull are more fraught with danger than others, and that certain degenerative psychoses consecu-

[1] Golebiewski refers to 449 cases of head injury, some of which were under observation twelve years; of these there were contusion or contused wounds, 259; contusion or contused wounds, complicated by concussion, 137; fractures of skull, 134; lesions of face, 76. Of the first named, 50 per cent made complete recovery without any pecuniary allowances under the insurance system. Of 114 fractures of the skull the vault was the site in 39 cases, and the base in 25; 19 cases made a perfect recovery, and 50 were totally incapacitated for support and rewarded accordingly; the rest received varying amounts. Among the number, 13 had delirium tremens, 6 developed epilepsy, and 8 insanity; while many presented the functional neuroses. There were 4 deaths, 2 having been suicides.

tive to injury, such as organic dementia, are almost intractable. This generalization does not absolutely exclude certain lesions of other parts of secondary or indirect development, and of such diseases as epilepsy, systemic degenerations of the cord, or rare forms of hysteria. In the functional or psychical post-traumatic neuroses the matter of temperamental influences must materially modify the prognosis, and what has been said regarding the introspective and aboulic life of the patient after the accident must be borne in mind, when we are called upon to say whether he will recover or not. It sometimes appears that the trauma is simply an accidental factor developing symptoms in an unstable subject, who may recover and have a fresh exacerbation through fresh influences that have no connection with the original injury.

CASE LII.—J. R. G——, 35, railroad employee, seen August 3d, 1886. While riding in a freight car six years ago it was derailed and he was thrown down and became temporarily unconscious and was delirious for some weeks. There were dislocation of the right humerus which was reduced, anesthesia of arm, forearm and hand; neurasthenic symptoms followed with insomnia and general ill-health for six months, when he recovered. A year later he was treated for gonorrhea, and a strong solution of carbolic acid was used as an injection, producing local inflammation and stricture; the nervous disorder returned, there was occasional vertigo, as well as frontal fulness and throbbing, ringing in the ears, and cramps at night in the lower extremities; he worried a great deal and was melancholic. After a long period of invalidism he again recovered.

In some cases in which the symptoms are decidedly profound and apparently resemble those of organic disease, there is often a complete disappearance of all symptoms and a return to the ordinary normal condition in even a

many who have presented functionally paralyzed muscles with disuse atrophy and other symptoms strongly indicative of serious disease of the central nervous system, but who were in time fully cured by psychic treatment.

In investigating and forming an opinion as to the existence and mode of an injury, and the probable duration of its effects, much help is afforded by the nature of the testimony of the patients themselves. An inspection of the sworn testimony in these cases impresses one, notably in street-railway accidents, with the improbable manner in which the alleged violence has been sustained. It is rare that a victim is struck by the car itself, or that the wheels or under part come in contact with them; there is even a poor history of initial violence, wounds being unusual and not so often found as in ordinary accidents. To the experienced physician who reviews an ordinary case, the absence of the common expressions of mental distress at the time of the accident seem at least strange; and there is a decided difference between the alleged incapacitating effects and appearance of symptoms under these circumstances, and others in which a person sustains a much more grave upsetting, the question of a lawsuit not arising at all. Nearly all of the "slowly developing" cases are closely alike in railway litigation, and differ materially from those in which the exerted violence came from an ordinary fall upon an icy pavement or from one's own carriage, although it is not for a moment held that nervous disorders may not sometimes follow these latter.

As a minimizing factor the cultivated expectant attention and failure to seek proper care imply a certain re-

A *B*

Case of Hysterical Paraplegia of fourteen years' duration.
The same patient after six weeks' treatment. (Purves-Stewart.)

nsibility upon the part of the patient, his friends and isers. As Fränkel says: "Generally, traumatic forms ysteria, particularly in men, give a *quoad valetudinem* vorable prognosis. External accidents, tardy appli- n of the proper therapeutics, or their frustration ugh lengthy legal proceedings, allow the malady to root too deeply, and future eradication becomes mes impossible." This is only the statement of miliar fact which should be borne in mind and ed to hurry to trial, or settle such cases as soon as ble.

he courts confine the medical witness to the expres- of an opinion which shall imply "a reasonable cer- y," and in the present state of our knowledge this etimes is a matter of exceeding difficulty. A fair, d survey of the particular case is absolutely neces- , and the judgment must be freely exercised, so that imperative that technical entanglements and theo- al conventions should be given a wide berth. To do the medical witness should not only have a sound of the pathogeny of organic disease, but a sufficiently d experience to take into account all the curious ations of functional disorder which are so closely d to mental departures. He should also be a student uman nature. All forms of accident aboulia recover me, provided the psychopathic inherited state of the vidual is not too deeply seated, and in such cases it ns hardly fair that the defendant who may be respon- e for a trifling shock or injury should be punished or cted when more than two-thirds of the contributing dition is due to some congenital neurotic vice of anization or to previous bad habits, not always easily

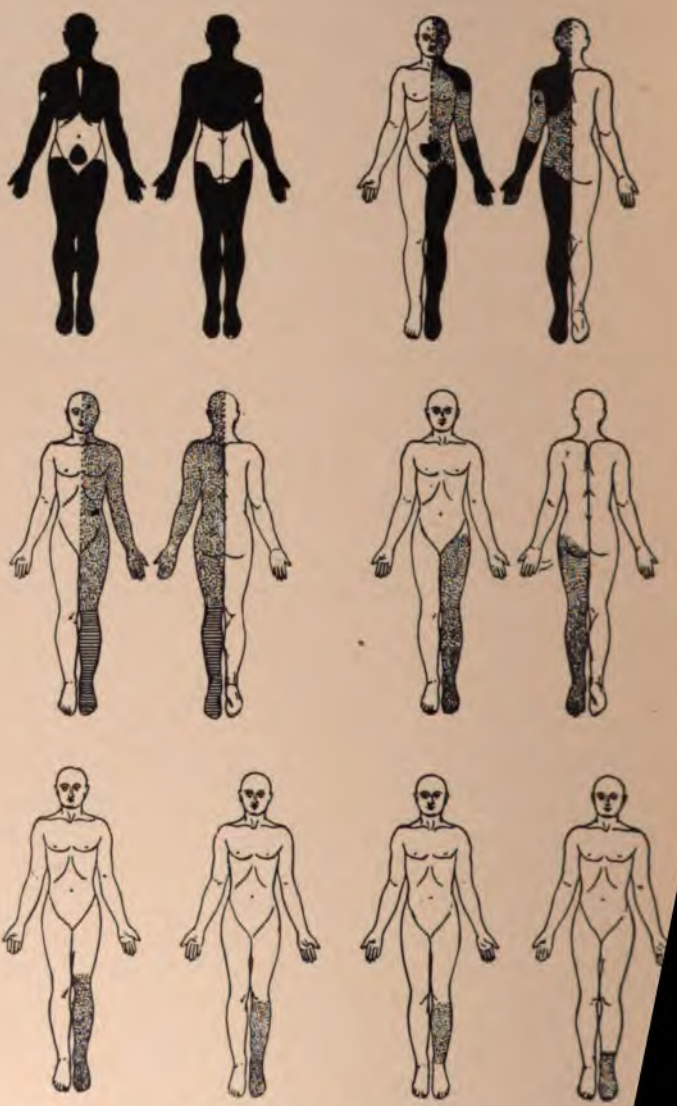
ascertainable.[1] In many of these cases some other cause might have developed the particular condition had there been no accident. In a few the state is intractable, particularly if the surrounding influence be especially bad and conducive to the habit of invalidism.

Case LIII.—Ellen D——, 17 years old, Irish, was examined by the writer, October 28th, 1899. It was alleged that when sitting on the front stoop of a house on Park Avenue, on the morning of June 2d, 1898, she was run into and thrown over by an automobile that mounted the sidewalk. She was picked up unconscious, but soon recovered and was seen by a physician two days afterward, who stated that she had not slept the night previously, that she was bruised all over shoulder and right hip, the left knee was swollen and he "thought he could feel minute bodies under the edge patella, but was not sure"; in fact "he had not made a diagnosis." She had been treated by this physician until the time of my visit, a little over a year, by strapping and bandages, when I was immediately impressed by her expression and attitude. While in no way did she appear to be the worse for her accident or an ordinary woman, there were nevertheless the peculiar placid facial expression and an air of helplessness and hopelessness so often found in protracted cases of the kind. She was seated in a chair with both legs rather rigidly extended, but it could not be said that there was paralysis, although she claimed that she could not raise her legs. In fact, when they were elevated and released she maintained the position herself. With great difficulty she was assisted to the bed, and when her interest was aroused she helped the doctor get off her bandages. There was no muscular atrophy, but a cer

[1] The author is indebted to Paul D. Cravath, Esq., for the history of this case of a man who claimed to have been severely injured by an electric wire that had been cut by some employee of an electric light company, and which fell, indenting his low-crowned hat, but not wounding the scalp or injuring him in any way. He almost immediately developed a series of nervous symptoms, and eventually a functional hemiplegia. It need hardly be said that the wire was dead, and that his condition was largely due to his fright and neurotic predisposition. In reality, the company was only guilty of a technical responsibility for the damage of his hat. The case was wisely settled, for there is little doubt that had he gone into court his nervous state would have been attributed to the carelessness of the corporation.

site hyperesthesia of both legs and the back as far up as the shoulders. There were for a day or two some hysterical anuria, and suppression of the menses, which were due. The physician who was called in gave morphine in large quantities and was unwisely solicitous and attentive, making numerous visits and proffering an unnecessary amount of sympathy. In a few weeks she could "not move arms or legs," yet she was able to shake hands with some of the friends who visited her, and upon one occasion got out of bed without aid. At other times and as a rule her alleged prostration was so great that the bedpan always had to be used, but she never needed catheterization. Being an attractive woman, she had a number of friends who were permitted to be with her constantly, and her personal appearance seemed to concern her as much as her condition, for she always insisted upon being dressed becomingly at the time of their visits. To her visitors her recital of symptoms was constant and impressive. A consultation of physicians was held and the diagnosis of meningitis was the result. At this time there was some analgesia, but no tactile and temperature loss, tests being made when she was blindfolded. There was some apparent contraction of the visual field, but this was doubtful. No actual paralysis existed, and the electrical reactions of the muscles were good, although there was slight diminution in response to the induced current. For several months before I saw her she had lain upon her back, with her feet drawn up and her knees bent, and it was only with difficulty that her lower extremities could be fully extended. Believing the case to be one of hysteria, I at once isolated her and she was systematically treated by mental therapeutics and properly disciplined, with the result that in a few months she was up and about and apparently perfectly well.

Other cases are harder to manage and slower to improve, and if there be combined injuries, the prognosis may be exceedingly bad. In a very small number the condition following mixed neurasthenia and hysteria is an absolutely permanent one, but in the experience of many years the writer can recall but one case of this incurable kind in which there were directly produced cerebral



Case of Functional Paralysis, showing gradual recovery and su
of anesthesia. (Purves-Stewart.)

or spinal lesions. This hopeless condition was the termination of an initial shock and a developing aboulic neurosis.

CASE LV.—This man was employed in shifting grain in one of the cars of the Erie Railroad, and when so engaged was thrown to the floor, as the result of a collision of the car he was in with a "wild" car ahead. He was much frightened, very cold, and had a weak, fluttering pulse. Upon his return to his home he took to his bed and made no effort to move or help himself. Within a short time he developed a fine tremor, which increased when he tried to take a glass or cup offered him, or used his knife or fork; this ceased when he was undisturbed. His legs were "cold" and insensitive, and his wife brought and applied an electric battery which he thought helped him. I saw him about eighteen months after the accident, and found him sitting in a wheel-chair. Both legs and feet were extended and quite stiff. He could raise his arms and legs with great difficulty, there appearing to be a general amyosthenia and a spastic rigidity, but no actual paralysis or contracture. There was a general atrophy due to inaction, and the electric irritability of the muscles everywhere appeared to be reduced. There were apparently waves of tremor attending the simplest movement and a fine fibrillary tremor of the muscles of the back, and a tic of the sterno-cleido-mastoidei occurred when he changed his position. His facial expression was blank and he appeared demented. The man answered questions slowly but correctly. The deep reflexes were generally increased. There were no sensory disorders, save a slowness of conduction. His extremities were cold and mottled and the skin was dry. There was much to indicate a central degeneration. There were no visual limitation and no atrophy of the optic nerve, but he had begun to have some incontinence of urine. The patient's case was settled, yet he remained in this helpless state and several years afterward had changed but little. Undoubtedly the man's mode of life and surroundings had a great deal to do with his condition; he lived in an isolated part of the country alone with his wife, who was a stupid woman, was without resources, and no attempt was made to arouse him or bring into play any mental stimulus whatever.

In speaking of these examples Preston says: "The question should always arise, Is hysteria responsible for all the symptoms?" and refers to Mitchell's suggestion that organic expressions "may sometimes be painted upon a hysterical background." Doubtless in certain intractable cases there may be a hysteroid state in association with certain expressions of central disease. When deep and serious mischief to the organs of the central nervous system has been done, and there has been great psychic shock, such a combination is highly probable, and in illustration a recent case may be presented in which the hysteroid tinge predominated.

CASE LVI.—Mrs. F——, a middle-aged woman, sustained injuries October 8th, 1892, in a collision at Menlo Park, N. J., she being in a car which was practically entirely destroyed as the result of a rear-end collision. She was taken from the wreck to a New York hospital, where she was seen and treated by Dr. Andrew McCosh, of New York. At the time, besides shock of the most severe kind, she sustained an extensive fracture of the pelvis accompanied with exquisite pain. I saw her on January 22d, following her discharge from the hospital, when she was in a decidedly agitated and tremulous condition, being easily excited. This irritability learned was fully in contrast to her former mental state, for before the accident she was self-possessed, quiet, and well-balanced, and helped her husband in his business, often meeting emergencies that required nerve and decision. At the time of my visit she was so susceptible to external influences that when an unexpected application of the electrodes was made to one of her legs, the current being very mild, she was greatly prostrated, her pulse becoming almost imperceptible. Her expression was peculiar, her eyeballs not seeming to move normally, and an examination by C. S. Bull disclosed the fact that she had lost the power of bilar convergence. One side of the face, the left, seemed than the right, and the corner of the mouth was more mar that side. The right palpebral opening was slightly larger t left, and the pupil of this eye was dilated. Her usual mer

dition was one indicating demoralization, marked by restlessness, occasional excitement, and loquaciousness; and I understood at times there was a great degree of irritability, which led her to treat those about her with unnecessary harshness; this also is in direct contrast to her previous disposition. She evidently suffered a great deal of pain when she moved, was honest in her complaints, and did not exaggerate. She had no important loss of memory, but evidently lacked the power of concentration and attention. There was weakness of the entire left lower extremity without atrophy, but response to both galvanic and induced currents was lowered. She could perform limited motions with difficulty, but could not abduct her thighs because of pelvic pains. Some weakness of flexors of both arms and hands existed, but it was worse on the left side. Although making an honest effort, she was able to move the dynamometer needle but a slight distance. Tremor attended almost every voluntary movement in the extremities. During quiescence her right shoulder and arms were at times the seat of a clonic spasm, and this was absolutely beyond her control. The tremor was ordinarily increased when she was under observation or embarrassed. Both knee-jerks were enormously exaggerated. The plantar reflex was absent on the left side, which is anesthetic. Ankle clonus was absent on the left, but present on the right side, the test producing coarse agitation; the superficial reflexes were everywhere increased to some extent. In addition to the deep pain that the patient located in the pelvis, and which she said attended every considerable movement, there was a point corresponding to the ninth or tenth dorsal vertebra where deep pressure would cause pain. Her whole back and the entire right lower extremity were hyperesthetic. She had also severe sciatic pain. The left limb was analgesic and there were blunting of tactile sensibility, direction sensibility, and thermanesthesia. This impairment seemed to be most marked on the outer side of the leg and thigh, and was most complete below, extending upward to a line corresponding to the crest of the ilium. I could find no zones of disturbed sensation except a deep painful spot below the right angle of the scapula. The field of vision was limited in the right eye, the objects outside of a certain area being lost, and her complaint of this was that she sometimes felt as if she was looking through a tube. There was some impairment of the color sense, the field for green being contracted. A previous examina-

tion some time before the accident had disclosed no trouble with vision. Hearing was unaffected, and smell and taste were normal. Heart sounds were weak, but not abnormal; pulse rhythmical, averaging 80. Patient cannot hold her urine, and it always dribbles from her. Sometimes she retains it for a time, but is obliged to empty the bladder very suddenly. There is an evident ammoniacal residue. Despite cleanliness, there is the familiar odor of a patient with incontinence.

The most optimistic statistics (those of Page) show that about seventy per cent of cases of the traumatic neuroses are cured completely and the others improved; but it is impossible to fix a time for recovery in an affection which has so much to do with psychic influences and other determining factors; while of course the broad statement that "these patients all get well as soon as their cases are settled" is manifestly unfair and untrue. That many of them do is true, but by no means all.

The prognosis of hysteria, so far as actual fatality is concerned, is not bad. Although the disease is conceded to be one that does not naturally shorten life, there have been a few reported deaths due to inanition and starvation, preceded by vomiting, and it would appear from the fatal cases of Meyer, Wunderlich, Fournier, and others that there was usually some complicating condition or some other cause of death. Fränkel reports three deaths, and concludes that such an ending may be the result of spasm or paralysis of any part of the respiratory mechanism; inanition due to hysterical anorexia, or uncontrollable vomiting; paralysis of the circulatory or alimentary apparatus.

Hysteria ordinarily, however, is almost as much a condition as a disease, lasting through life, always modifying the conduct and appearing in certain subjects in

those of the pre-antiseptic era. Rules then enforced are now entirely abrogated, and the methods of to-day would have made our surgical ancestors protest loudly. One respect in which we violate precedent is in our disregard to-day of the periosteum or pericranium. This is sacrificed without hesitation when found to be infected or torn, or lacerated beyond the capability of repair." If, therefore, the measures of surgical relief have been insufficient, or if strict antiseptic precautions have not been taken (which to-day seems incredible), this neglect must diminish the liability of the defendant; or if the patient will not submit in good time to properly determined surgical procedures which will modify the pressure perhaps of depressed and fractured bone, or will continue through habits of dissipation to aggravate an existing cerebral or meningeal affection of a traumatic nature, these things should be considered as they are by insurance companies, and in some measure should diminish the size of the verdict.

We are called upon at times to judge of the gravity of the fracture as well as the question of the kind, extent, and duration of loss of function, as well as the remote consequences so far as they concern the duration of life.

It is with the so-called healed fractures, which may or may not be connected with meningeal or cerebral complications, with which we have to do in actions for damages brought by the survivor or his guardian. In regard to the gravity of fracture, it may be said that those of the vertex alone are far less important or dangerous than those of the floor of the skull, and recovery without complications is quite possible. Considerable depression of the vault may exist for years without any serious injury

of the parts beneath, and it is sometimes incredible how some individuals go through life as comfortably as they do with deep indentations with which one would naturally connect more or less underlying pressure. There are exceptions, however, when a chronic meningitis of slow and unpreventable progress occurs in connection with displaced bone, which is preceded by cortical destruction and widespread disease of deeper parts, and ends in death. Sharply made fractures, either at the vault or base, heal quickly, and rarely leave any considerable trace, repair being almost perfect. They may sometimes do no very great harm except when the primary separation has been considerable, when the brain or its covering may be impinged and lacerated. As this form of fracture heals so quickly, it is often utterly impossible, after three or four months, to claim that uncomplicated stellate or linear fracture has existed. Such fractures, on the other hand, often occur without any brain injury at all, except when they involve the orbit, when its contents or the frontal lobe may be subjected to dangerous violence through the agency of a detached fragment of bone. Helder has found that of 96 fractures of the base there was fracture of the vault of the orbit in 73 cases, the superior wall of the optic canal being involved 53 times, and subvaginal extravasation existed in 42 cases with resulting complete unilateral amaurosis in 27. Baudry refers to the danger of a violent rupture of the optic nerve and its sheath, even when the fracture itself is inconsiderable, and speaks of the bad prognosis of absolute blindness with or without the ophthalmoscopic appearance of hemorrhage which is found on the return to consciousness, while the preservation of a part at least of peripheral visual func-

tion is a hopeful indication. A direct fracture, however, of the superior wall of the orbit is grave indeed, and the mortality, according to Berlin, is about eighty per cent.

Phelps, who takes a rather hopeful view, says: "It is therefore true that in themselves cranial fractures are important only in exceptional cases. Their prognosis is really the prognosis of their complications." The immediate osteal injury is, therefore, in itself not dangerous, it is only the connection with concomitant lesions. Roughly speaking, the cases of Phelps (1900) show that two-thirds of all that involved the base, and about one-third of those confined to the vault, were fatal. Mumford (1893) presents an analysis of 300 cases of fracture of the skull, 165 of the vault and 135 of the base; of these 56.06 per cent died. There were 279 compound and 21 simple fractures; 80 per cent of the cases of basal fracture were fatal, and of the vault 37.05 per cent.

It does not appear then from available statistics that fracture in itself is so often the determining cause of death. There are sufficient examples among the large number of cases brought forward by various writers to show that there is a great variation in their causation and in the consequences of injury, and these are at times unrecognized. Blows not sufficient to break the cranial bones may give rise to necrosis, and the outer or inner table may be the seat of obscure changes which are at times masked, all external appearance of scalp injury having disappeared. In rare cases like that of Howship, the cranial bones may be injured without any external wound, but with consequent atrophy and absorption of bone. The case of this author was that of a child who had a fall and sustained an injury of the right parietal bone, but

there was no wounding of the scalp whatever. Some weeks subsequently a pulsation of the brain could be perceived and paralysis supervened. Sometimes there are confusing symptoms, and when another serious head injury has perhaps been received at a previous time, it is occasionally difficult to say to which the symptoms found are due. The case of U. H—— which did not find its way into court, is an example of this, and though his symptoms were indicative of at least two central lesions, he at the last time probably sustained a fracture of the base and possibly of the left temporal bone.

CASE LVII.—U. H——, 67, president of a corporation, was seen by the writer in 1886. In 1873, while closing a boiler door which had been insecurely fastened it fell, cutting a scalp wound over the right parietal region. He was unconscious "for a minute or two," but laid up for two weeks. He convalesced, but afterward there were right-sided facial neuralgia, occipital pain on both sides, a great deal of nervousness, insomnia, and he was advised to give up his work for a time; but in eighteen months recovered entirely, so that he was able to travel upon business.

January 31st, 1885, while in a Pullman car, a slight collision occurred and he was thrown to the floor, striking his head on the side. There was a transitory loss of consciousness, and when he raised his hand to his head he found an open flesh wound on the left side, near the vertex in the lateral parietal region. On recovering he was confused, but could talk, and after the accident was taken to a hotel. There was pain in the left ear, which has lasted ever since. In a few days vision disappeared in the left eye and with this all sense of smell on that side. There was numbness in both hands, more marked in the left, the fingers being anesthetic. The right leg was weak and without feeling, so that a pin could be thrust into the surface without being felt, or causing annoyance. He could not walk without help for six or eight weeks, nor could he swallow or speak without great pain being caused in the back part of the throat and at the angle of the jaw. Six months later he consulted a Chicago aurist who, because the pain in the

left side was so severe, opened the drumhead with a resulting escape of pus and blood and consequent relief for some time. He was first seen by the writer one year after the last accident. He complained of tenderness and pain over the left mastoid processes and above the ear; there was almost constant headache and he could not walk steadily. There was at times tenderness, with throbbing on the left side of the head. If he attempted to read there was orbital pain on the left side, and if he persisted his vision utterly failed. The knee-jerk on the right side was exaggerated, and there was anesthesia of the left foot. Both pupils were sluggish, and indications of optic neuritis on the left side were present.

Some individuals may receive seemingly incapacitating injuries and yet be able to seek assistance or do many things that may be required of them at the time. A laborer was struck upon the head with a pickaxe, the point entering the skull and the brain to the depth of the left lateral ventricle, yet he walked one mile and a half to the hospital. Certain persons who may survive the shock of a penetrating wound with the introduction of a foreign body which does not injure an important part of the cerebral apparatus may lead comparatively comfortable lives with encapsulated bullets embedded in the brain, and the celebrated Massachusetts subject whose frontal lobe was pretty much all destroyed by a premature blast, which sent a tamping iron through the anterior part of his head, and who lived for years in comparative health, is too familiar to be detailed.

CASE LVIII.—In this connection attention may be called to a very interesting case reported by Keate, the patient being injured in the same manner. When the doctor reached him two hours after the explosion his pulse was 30 per minute and very weak. The eyes were blown out, the skin and muscles and forehead were partly blown off, while the anterior portion of the skull cap was

turned back over the parietal bones. The orbital plate of the frontal bone was blown into the brain, and the brain substance exuded through the opening into the cheek. There was also a hole in the centre of the frontal bone about the size of a silver ten-cent piece, through which the brain substance exuded. All the membranes of the brain were badly lacerated, as were its frontal lobes. "After trephining, I removed twenty small stones and several pieces of bone, together with considerable dirt. Most of the foreign bodies were located at a point corresponding to the anterior fontanel, deeply buried in the brain. A large piece of bone corresponding to the roof of the orbit was extracted through the opening in the forehead. The amount of cerebral matter which came away weighed one ounce. The patient has never for one moment been unconscious. His mind has been perfectly clear, and he can readily recognize his friends when they speak to him. He answers all questions intelligently, and describes accurately the details of the accident. He has never complained of pain, and says the anterior portion of the head feels paralyzed. During the first two weeks his temperature ranged between 100° and 103° F., but during the last two weeks it has been practically normal.

"He has been able to get up every day since the accident, and locomotion is good. It has been just a month to-day, and as I write this article the patient is sitting in a rocker on the porch in the fresh air, chewing tobacco."

The prognosis is in many cases difficult, when incomplete *spinal lesions* exist, but in those in which there have been extensive injury and complete transverse destruction of the cord, the task is easier. Fracture or dislocation of the upper part of the cord above the third cervical segment is usually almost immediately followed by death, although the patient may last a few days; but in a comparatively small number of examples when the cord is not impinged upon or to a slight degree, life may be prolonged, the patient even lingering for a number of years. In some cases a sudden movement may result in the dramatic

death of the patient, if the atlas and axis be involved, and the case occurs to the writer of an individual who had had an obscure neck injury and who, on turning his head suddenly to speak to a member of his family who was enter-

FIG. 34.—Keates' Case of Head Injury.

ing the room, dropped dead as the result of the forc[illegible] encroachment of the odontoid process upon the med[illegible] Even when there is union of the fracture itself, t[illegible] may be a tedious and ultimately fatal myelitis.

It has been noted by surgeons that in more than

one-half the cases of fracture of the cervical vertebræ, the processes are broken rather than the bodies, while in more than two-thirds of the fractures which occur in the dorso-lumbar region the bodies suffer. In the cervical region the danger increases with the proximity to the medulla. A severe fracture of the dorsal region may result fatally in three weeks or a month as a result of hypostatic pneumonia, and in the lumbar region in from three to four months as a consequence of exhaustion and sepsis following cystitis and pyelonephritis. Of course there are a large number of cases of dorsal and lumbar fracture or dislocation which make a fair recovery and which are cured by proper treatment.

Upon the authority of Walton the average duration of life in fracture of the cervical vertebræ is little less than a week, and of thirty-six cases collected at the Massachusetts General Hospital the average time was fixed at five days, these being cases in which no operation had been performed. The prognosis is somewhat better in fracture of the dorsal and lumbar region without operation, the mortality varying from seventy-nine to eighty per cent, which is bad enough; but when surgical relief is afforded, it is reduced to from forty to fifty-seven per cent.

It would appear that American surgeons are less successful than those abroad, for at the hospital above referred to, the fatality was sixty-six and two-thirds per cent, which is greater than that of either Chipault and Thorburn. It does not appear that any material advance has been made in the very modern methods of treatment, but that operation has reduced the mortality to an encouraging degree, and in suitable cases should always be resorted

to if possible. In such cases we may avail ourselves of the Roentgen rays as a diagnostic aid.

There seems to be almost a unanimity of opinion that when the bones have been crushed an operation is unjustifiable, except when the injuries are confined to the cauda equina or to the vertebral arches. Walton takes a firm stand in advocating an operation, believing in the fallibility of even the most careful diagnosis, and arguing that it will often disclose a condition of affairs that may be rectified. He does not favor surgical interference while grave shock exists, but as soon as possible.

When the patient's vitality is not sapped by sepsis from the causes mentioned in a previous chapter, or from bedsores, there may be a let up in the compression and the active processes of cord inflammation, the victim living for many years in a more or less helpless condition.

It occasionally occurs that previously existing disease may materially interfere with satisfactory diagnosis, or may remain as a complicating condition even after the direct effects of the trauma have passed away. These complicating conditions may have a decided medico-legal interest, mitigating in measure the culpability of the defendant. Edes reports a case of injury due to a fall in which pronounced muscular atrophy of both hands occurred in connection with symptoms indicative of postero-lateral degeneration. The man, however, presented a lead line upon his gums and other evidences of plumbic toxemia. A converse illustration is the following:

CASE LIX.—In a personal case which went into court the plaintiff was a man who, while sitting in a street car, received severe spinal injury by reason of a collision with a heavy wagon. The pole of the wagon was forced through the back of the seat,

striking him squarely in the middle of the back. He subsequently developed a meningomyelitis with great pain, irregular paraplegia, and atrophy of the muscles of the lower extremities. When he sued for damages, evidence was brought forward to show that his occupation had been that of a painter. He had not worked at his trade for a long time before the trial, however, yet one of the witnesses thought he discovered a lead line. I could find no such change, but did find that his teeth were carious, and that he did not clean them, and the result was a spongy condition of the gums. His motor symptoms and atrophy were confined to the lower extremities, a very uncommon situation in lead disease, and there was no anesthesia. His reflexes were exaggerated, and his upper extremities were not involved. I subsequently learned that though he did not work at his trade after the trial, the symptoms advanced. A verdict was rendered for the plaintiff.

The recognition of *traumatic epilepsy* and the possibility of its cure by surgical interference must arise at times. This affection may result, as has been shown, from cortical lesions due to trauma or to fracture of the inner table of the skull with depressions or exostosis. The writer has known it to be produced by the penetration of the orbit by a splinter, and recalls a case in which a mounted officer rode into a low tree, one of the twigs of which pierced the vault of the orbit producing symptom of disease of the frontal lobe and a cortical epilepsy which lasted for many years without any general or serious trouble, but this is exceptional. In many cases the cortical lesion not only gives rise to the convulsive affection, but ends in the production of a hemiplegia upon the opposite side of the body. Again, the epileptic paroxysms may be due to some early local injury at a distal point. In epilepsy due to peripheral nerve injury, cases have been reported by Hufeland, Féré, Billroth, and Hadden in which the removal of a piece of glass from the foot or the exposure

and stretching of some of the nerves of the lower extremities has led to a cure, when the fits have followed a fall or local injury.

In giving the history of their affliction epileptics are apt to ascribe the disease to falls received in early life. It is to be taken into consideration that the fall is often consecutive to the fit, which was due to some other cause and that the first attack has been misunderstood. This view is likely to be taken by uneducated or unobserving people. Bailey does not believe that even one per cent of the cases of the disease are the direct result of injury. We should not forget that after shock or slight head injury, attacks may appear in persons who through hereditary predisposition, alcoholism, or some other general depraved cerebral condition are susceptible to them. But few of the psychical equivalents of ordinary idiopathic epilepsy appear in the traumatic variety. While we may sometimes in the early stages help such patients by surgical procedures, nothing does much good when the brain becomes the seat of a progressive and grave degeneration which is the rule if the blow has been violent, and especially if there has been laceration due to fractured bone.

The relation of surgical interference to prognosis seems to show that heroic measures are not always necessary, and that when the epileptic paroxysms follow the creation of a superficial wound or cicatrix, the early use of the actual cautery or some other revulsive may result in a disappearance, even at times when the disease is recognized as a cortical manifestation. The relief afforded by trephining or other surgical procedures is fairly encouraging, especially in those cases in which the blow has produced a hemorrhage, abscess, or some neoplasm consecutive to

meningeal injury. Of course where fractured and depressed bone exists, its removal is clearly indicated, and much good may be expected. Some older authorities, among them Echeverria, report a large number of cases in which two-thirds were either cured or improvement occurred. The modern results are even better, as the statistics of Horsley, Keen, and others show. Of course it need hardly be said that the longer the operation is put off the poorer are the patient's chances. There seems to be at present some reaction from the optimistic opinion generally entertained a few years ago in regard to the advantages of cranial surgery, but I think this applies mostly to operations for tumors and other non-traumatic lesions.

The most careful investigation should be made with a view of determining the existence of old epilepsy and the stigmata peculiar to certain persons who are likely subjects. In some kinds of malformation of the cranium, in extreme degrees of asymmetry, such as dolicho- and brachycephaly particularly, and oxycephaly, scaphocephaly, as well as various departures from the normal standard, we may recognize the soil in which the disease flourishes. Defects of the eyes, the shape of the ears, and in fact various stigmata of a congenital nature are all significant in predisposed subjects.

In old epileptics evidences of tongue biting, and scars upon the scalp due to old falls that may have preceded the alleged accident, may be found, and should be kept in mind when considering the patient's claims. Cases which are said to have developed two or three years after the alleged accident must be looked upon with suspicion, for the rule is that the paroxysms begin within a few months. It is true that exceptional cases have been reported in

which the epilepsy appeared several years after the injury, and in one case after fourteen years, but this is rare. The local mischief as a rule is quickly produced, and with the exception of pachymeningitis, in which the cortical pressure and consequent irritation are of tardy growth, the début of the epileptoid attacks is not delayed.

Injuries of the peripheral nerves are as a rule curable, unless there be very extensive disorganization of the nerve trunk itself, or some migrating neuritis. In recognizing the gravity of such injuries it may be borne in mind that crushing wounds are necessarily more intractable and more productive of deep-seated mischief than where there is a clean cut. Should there be neuromata or active and long-existing neuritis, the outlook is serious, but not necessarily very bad, for the former are of course removable, and the patient's sufferings may be at least ameliorated if not removed. It does not do to venture a diagnosis too early, for, as Mitchell has pointed out, there may be much distress when a large number of filaments are bruised in addition, perhaps, to section of a large nerve, and under such circumstances we must wait until there is a disappearance of pain and other sensory disturbances which are the effects of shock or due to the pressure of exudates. The regeneration may sometimes be so complete that, as has been pointed out, there may be a fair possibility of remote repair, or at least some return of function, even where a large piece of a nerve has been removed. Of course electrical examination is the most conclusive and reliable mode of determining the ultimate prognosis in such cases, and if the reaction of degeneration has been found, and has been succeeded by an absolute loss of elec-

CHAPTER IX.

FRAUD.

"If falsehood had like truth," says Montaigne,[1] "but one face only, we should be upon better terms, for we then should take the contrary to be what the liar says for perfect truth; but the reverse of truth has a hundred thousand shapes, and a field indefinite, without bound or limit. The Pythagoreans made *good* to be certain and finite; *evil* infinite and uncertain; there are a thousand ways to miss the white, only one to hit it."

The limits of false representation are unknown, and may vary from simple exaggeration of real symptoms to downright criminality; from a form of deceit which coquets with truth, in which ordinarily virtuous and honest people forget their every-day morality—to the well-laid and deep plans of professional malingerers and syndicates of rascals who concoct far-reaching plots to defraud corporations.[2] Strange to say, the first-mentioned cases are

[1] Essays (Trans.), 1875, vol. i., chap. 9, p. 84.

[2] Bailey has described the operation of the notorious Freeman family, who mulcted several railroads in various parts of the country and who obtained considerable sums in settlement; but the career of Doran is an illustration of how much further picturesque swindling may go in these days of competitive fraud.

"The first of his series of operations was in April, 1900. He was riding on a car with a friend named Ritner. He fell off and gave his name to the conductor as Ritner, while Ritner became a witness under Doran's name. Then Ritner went to bed as the injured man and Doran went out to fall from another car. The company paid over $60, but suspected a fraud and caused the arrest of Ritner, who was sent to prison for one year. In August of the same year Doran, in company with a man named Myers, did the same

most difficult to deal with, for the patients find no
ble in engaging the services of sympathetic doctors
lawyers of the highest standing; and the ordinary
t of the railway company to protect itself is looked
ı as a little less than cruelty.

When the time for trial comes the patient is brought
court upon a litter, surrounded by flowers and at-
ed by an entourage of silly people. It has been the
ɛr's privilege to meet with many of these cases, and it
not appear that the deception is always deliberate;
the story of suffering is apt to vary with every fresh
estion, it being difficult to draw the line between
ı and falsehood. It is often easy to find that when
under observation, they are enjoying the ordinary
sures of life. The literary lady, who has had a harm-

taking Myers' name and securing $10 from the company. In October
ing, Doran persuaded his wife to throw herself from a car at a corner
Doran and two friends were prepared to become witnesses. The
n was arrested, but the case was not pressed. A few days later, riding
ı man known as Mutschler, he again jumped from a car and got $10.
time Mrs. Doran, smarting from her ill-treatment, 'peached' on Mut-
, who was convicted and sent away for a year. On November 29th,
ı man named Duffy as a witness, Doran stepped in front of a car, using
's name, and got $15. Three days later he did the same trick with his
ɛr, Bernard S. Doran, as a witness. Bernard was arrested and got
months; Doran himself got $10. Again, on December 12th, with
es Brit, Doran got $5. Ritner left jail in December, 1901, and pressing
ıto service again, Doran used his name and tried to bunt a car off Ger-
ɔwn Avenue. The case was settled for $5. Then a woman known as
Brodie stepped in front of a repair car and sued the company for
ɔo. We suspected her and she fled to Union Hill, N. J., where she
rrested. She received a five-year sentence. In each of these cases—
ıere were dozens I have not mentioned—Doran, after performing the
atic part of the task, assumed the name of his 'pal,' while the 'pal'
to bed as the injured person. This served two ends—Doran, as a wit-
escaped arrest each time, and as a professional contortionist he was
o get out the next day and fall from another car, to keep the wolf from
ɔor. No amateur could possibly have undergone the pounding he
for two years."—*New York Sun*, October 6th, 1902.

less fall, and whose pelvic contents in consequence are hopelessly "dislocated," and whose spine is permanently "concussed," receives the examiner in all the theatrical regalia of invalidism, indulging in tears and other appeals to his sympathy, and after the visit dresses herself, and goes to teas and the opera, or spends long hours with the dressmaker. In other walks of life the neurasthenic and "paralyzed" shop girl leaves her bed to wash clothes or go to the picnic. The long paralyzed hand of the plaintiff and its fellow are horny, and bear the traces of recent dirt, and work interrupted only by the doctor's visit. It is needless to refer to such transparent cases as these, which one sees frequently, except to show moral obliquity. An instance which I witnessed, and which has since been reported by Godkin, is that of an apparently helpless man, who with great difficulty took the witness chair, and after testifying to the absolutely paralyzed condition of his right arm, was quietly asked by the defendant's counsel how high he could raise his hand *before* the accident, and without a moment's hesitation he thrust it high above his head. The same thing occurred in a case against the Forty-second Street and Manhattanville and St. Nicholas Avenue Railroad Company. The plaintiff, who received a verdict of $5,000 for a collection of vague symptoms and alleged injuries and who in the court-room was the picture of helplessness, made a violent and apparently muscular demonstration of joy when the jury announced her good fortune. There are other cases that are far more subtle because of a mixture of reality and pretence, and it behooves the investigator to exercise the greatest care so that no injustice be done.

Some of these patients are honest enough at first, but

undergo a moral degeneration that often ultimately leads them to disregard the truth. There is then a limited responsibility, for the lies as a rule are not deliberate, and often spring from an actual belief in the reality of the morbid condition. The *ego* or organic memory is at these times so deranged that there is resulting feebleness of judgment, betokening a state which is neither hysteria nor downright malingering. It has been recommended that the cases in which litigation is a feature should be isolated and watched in a hospital. Against this may be urged the probable bad influence of association with the invalids by whom the subject may be surrounded, and it is therefore better to watch such patients without their knowledge, to interview disinterested friends and neighbors, and to receive the plaintiff's statements with caution, bearing in mind his possibly altered psychical state. The importance of rigidly investigating the antecedents of the alleged neurasthenic cannot be too strongly urged, for not only must the existence of the inherited predisposition be appreciated, but a possibly vicious mode of life, which naturally he will do his best to conceal, may account for all the symptoms, and sometimes an alcoholic neuritis will be ascribed to a trauma.

Such an example was that of a man who claimed that a long list of symptoms of apparent organic disease was due to a head injury, and by the merest accident his name was found upon the books of a hospital, showing that he had been a frequent inmate of the alcoholic ward, and had subsequently been treated for the identical symptoms which were alleged to be traumatic. In the absence of such knowledge and as the defendant had been denied a personal examination, it would have been difficult to have

gone into court with any good defence, or to have contradicted the plaintiff. It may not be necessary even to show that vicious provocative causes were exerted immediately before the receipt of the alleged injuries, for a continual and remote indulgence in drink, even if it were unrecognized by most of the particular community, is sometimes sufficient to cause an ultimate breakdown beneath a shock which any ordinary healthy man could stand. Perfectly legitimate brain work, if exercised under certain circumstances, will do the same thing. In neurasthenics past middle life who claim that their condition is due to or has followed an accident, it is quite possible that these things enter into the case, as well as past debilitating diseases.

The excessive use of tobacco continued over a number of years is often at the root of neurasthenia, which is profound and intractable, and numerous cases of nicotinism undoubtedly exist that may be taken for more serious affections. All the motor weakness, ocular symptoms, insomnia, and hypochondriasis of neurasthenics may be due to this agent. The railroad company should be as careful as that which insures lives, in the matter of medical investigation, as well as the collection of information regarding the previous mode of life of the plaintiff, for there is every bit as much reason for caution.

Since the introduction of electricity into street-car propulsion, a number of persons have brought suit against corporations for alleged injuries. The burning and shocking of some of them have formed the basis of bonafide actions and material claims; a large number of others, however, have been tried, and the exhibition of an immense amount of ignorance in regard to the nature of

electricity and its effects upon the human body has been shown. Sometimes the claimant ascribes the alleged state of ill-health to poisoning from the fumes of the storage battery in the car in which he had ridden for a short time, or his "shock" has been received from a current of such low voltage that it would hardly kill a fly. One dishonest woman whom I saw had been hurled twenty feet, "by stepping on an *insulated* wire." She claimed to have received a burn, but a small spot of chronic eczema was all that was found. The following newspaper account of an occurrence of this kind is an example of these absurd and impossible claims:

"It is not often that such a concise description of the torments of a severe electric shock is given. This narrative supplied to the *Journal* by Mrs. X. proves that the trolley car is versatile in the infliction of pain. Mrs. X. is still an invalid, although it is a week since contact with a defective car heater threw her into paroxysms of agony unlike anything she had ever imagined. The most striking visible trace of her adventure is a patch of gray hair over her right temple. It produces a startling effect, this patch of gray among the bronze, and is the more remarkable as the face beneath it is young and comely. 'Yes,' said Mrs. X., seeing that the eyes of her visitor were attracted by this singularity, 'that is one of the results of my experience in the trolley car. Is it not strange and distressing? And it only happened last night. I was quite startled this morning when I saw the change. It was there on my temple, that I felt and feel yet one of the most violent of the many symptoms produced by the electricity. There is nothing I can compare it to except a heavy hammer, hammer, hammer here on my temple.'

"She was resting at her home at —— muffled in shawls. It is a beautiful home, commanding a view of the mountains and surrounded by lawns and flower beds. Her face was pale and showed traces of pain. 'I had been making some calls,' she continued, having been asked to tell her story from the beginning. 'A car of the traction company's line stopped for me at a street corner, and I entered it with the intention of returning home. As it happened, there was a vacant seat over one of the heaters which are placed under the benches. There is a metal register projecting several inches from the heater. I can't tell you exactly why it happened. But when I sat down this register came in contact with my leg. That was when the shock came. Describe it! oh dear! I can feel it now. It has been returning to me ever since. Why, it was a complication of sensations. I remember distinctly doubling up. My chin and my knees were pulled together by a swift and irresistible force. It seemed to me that my bones had melted. That's the only way I can convey it —my bones had melted, and my interior was quivering, etc., etc."

It is probable in this case that the unfortunate lady had accidentally come in contact with a hot rheostat, but it was certainly doubtful if she underwent these extraordinary contortions at all unless the circuit was completed by her body, and then she would undoubtedly have not been here to give the interview to the reporters. The fear of electricity probably causes the susceptible individual to magnify ordinary accidents and to invest trivial injuries with a new and undeserved importance. Knapp, Bailey, Dana, and others have recognized the form of hystero-neurasthenia, due to electric accidents, which is so com-

mon of late, and numerous cases are recorded of persistent states of agitation after fright, while the sight of an electrical accident has been known to upset a neurotic subject (vide p. 258). Real injury is rare, strange to say, and more people are hurt by broken glass and splintered wood than by the receipt of discharges of electricity. Of course the element of fright enters here as it does in ordinary railway cases, and perhaps to a greater degree. The newspaper account of another case is highly characteristic of the state expressed by evanescent paralysis and vague nervous symptoms: "Mrs. X., who was taken to Bellevue Hospital Monday evening suffering from the effects of an electric shock received while riding on a car, was discharged yesterday. The effect of the shock was unusual, according to the hospital physicians. Mrs. X. was supposed to have received it by stepping on the iron slot at the car door, which had become charged in some way. The direct result was paralysis of the right side of her body and incidental hysteria, although no burns or discolorations were apparent. The paralysis passed away during the night, and the only development yesterday morning was a slight tingling sensation in the left leg. Yesterday afternoon Mrs. X. was taken home."

An example of malingering which is conventional may be cited. It is of interest because attempts at fraud were made by the dishonest claimant or his friends.

CASE LX.—A man of 55, of prematurely aged appearance, fell into a coal hole in September, 1898. He states that he fell over, striking the left side of his head, and as a result he immediately became unconscious and was removed to his house in a carriage. Up to the present time (August 13th, 1899) he has been helpless and bedridden, declaring that he cannot move his legs, much less walk, that he has been deaf, and that he hears two

different noises constantly, one of high pitch and the other deep; that this ringing followed with the deafness immediately after the accident, "but that his hearing is better downstairs than up." He says that his head is drawn to the right side, and that he cannot turn it; that he cannot use his arms in any way, and his assumed position and apparently complete disability would suggest this. At times he passes his feces in bed, and says that it is impossible for him to hold his water. I carefully examined the man, bringing out the following points in his history: That there was no escape of blood from his ears, eyes, or mouth, or any sign of fracture of the skull; and that his unconsciousness could not have been serious, for when he forgot himself and became interested, he minutely detailed the happenings at the time, when he was able to take a lantern and search for his watch and package of "lunch" which he had lost when he fell. He also referred to the anxiety and behavior of his wife and daughter, who were with him.

He now presents no scars, his pupils are even and react properly, and there is no affection of vision. His tongue is protruded in a straight line, his heart and circulation seem to be normal, and there is little or no appearance of bodily change. With some little urging he was able to get out of bed and walk awkwardly, the toes being turned in, and though there was apparent stiffness there was nothing, however, suggestive of spastic paralysis. This changed decidedly before the termination of my visit, which lasted about an hour, and he used his feet and legs freely. With the right hand, which he said was "more paralyzed than the other," he was able to point out the places upon his head where he said he had been struck. The response to both electric currents was excellent. There was no anesthesia. When I saw him a few days afterward by appointment I found him in bed looking anxious and worried, and complaining bitterly of his helplessness. With some ostentation he referred to the condition of his bladder, and when I pulled down the clothes found that there was a large piece of cotton cloth, several yards square, completely saturated with urine, which he said had been placed there dry but an hour before. The quantity was so excessive that I felt sure that he was trying to impose upon me, and at the end of my visit I took a piece away, and later subjected the fluid to a rough analysis, which showed that it was not urine but simply water. Although he

claimed this condition was constant, I found nothing of the kind at my previous visit, and there was none of the odor which is as a rule found when there is continued incontinence. He admitted that he could hear a little with the right ear, but that he was absolutely deaf in the left. The ends of two rubber tubes, connected with the phonendoscope, were introduced into the meatus of each ear. When it was found that, after compression and closure of the soft-rubber tube that went to the left was made without his knowledge, he declared that he heard a question asked him, it was obvious that there was no trouble with his pretended deaf ear. This man, of course, received nothing, and shortly afterward went about his business apparently well.

Page, whose extensive experience as an examining physician for one of the greatest English railroads entitles his views to great respect, has published over two hundred cases of alleged railroad injury. Of these thirty-two were frauds or cases of wilful exaggeration, twenty-one substitution cases in which there was a history of gout, phthisis, chronic epilepsy, or alcoholism, "female diseases," or conditions of previous ill-health; six women alleged that the nervous symptoms of the menopause were due to injury, three had been in previous accidents, seven were the subjects of fright or suggestion, and one case of glycosuria was attributed to an accident, but was shown to be of previous origin, and in another an old syphilis was made to do duty; in one case in which insanity was claimed to be the result of an accident, it was proved to have antedated it. In forty-four there is a history of "no exaggeration," or the patient made a moderate claim; of the above cases, therefore, it will be seen that at least in two-fifths there was a suspicion of fraud.

SUBSTITUTED DISEASE.

Dishonest litigants, either through their own cunning, or with the help of others, are apt to make old injuries or the symptoms of previously existing disease do duty in the presentation of suits against corporations, and while such attempts are as a rule made knowingly, it happens from time to time that the patient connects with the accident certain conditions that have long existed and of which he has been unaware.

Sometimes a trivial injury followed by simple subjective symptoms causes him to seek a physician whose knowledge of his profession is rudimentary, and who is careless as to overlook the already existing disease, and ignorantly to ascribe the symptoms to the new violence; or, on the other hand, he may be so disreputable as to seize upon anything he can find to bolster up and strengthen his client's case.

The term "substitution of origin" has been applied to this kind of cases, and the duty of the defendant's physician is to ferret old symptoms out if possible, and be on the alert for evidences of inconsistency; in fact, in the determination of the amount of injury, should such exist, the doctor should always pay the closest attention to the chronological development of the alleged symptoms, and to the previous history of the litigant. Under some circumstances it may be found that he has brought other suits, and has received substantial damages for conditions which are again brought forward.

CASE LXI.—A recent case illustrating the failure to secure compensation for a real injury by a dishonest plaintiff who resorted to unnecessary perjury on the witness-stand to strengthen his plea,

is that of McFadden versus the Metropolitan Street Railway Company, and as a result his counsel threw up his case. McFadden was seriously injured by a car which ran into a truck he was driving, and in consequence there was an undoubted central spinal hemorrhage. When examined by Dr. Hirsch and myself, we found evidences of a laceration of the gray substance of the upper lumbar cord, loss of bladder and rectal reflexes, atrophy of the glutei with reaction of degeneration, and a disassociated saddle anesthesia, the tactile sense being unaffected. In this accident, which was in August, 1901, his coccyx was also fractured and subsequently removed, the scar of the operation being found. At a higher point was a longitudinal scar as well as other evidences of an old injury, there being no suture marks, however, and he swore positively that he had never been in a hospital. Thanks to the skill of the detectives of the company, it was disclosed that ten years before the first accident he had fallen from a loft and was taken to the Post-Graduate Hospital and a laminectomy performed by Dr. Powell. Though the cord was not crushed at this time, there were an irritative lesion, paraplegia, and incontinence, from which he recovered; and for a long time he had been doing hard work driving a truck, and his wife had borne him two children, both of whom were under six years of age Had it not been for his perjury and attempted concealment of his early accident, he would undoubtedly have received a substantial verdict.

The case of Kelly vs. the Metropolitan Street Railroad may be also referred to in this connection:

Case LXII.—W. K——, 44 years, laborer, who in 1885 had received a fracture of the skull, from which he had recovered, subsequently developed a striking and characteristic train of hysterical symptoms, and for many years was shown at several clinics and lectured upon. On April 8th, 1901, he claimed to have been injured in an accident, and sued the corporation, the case coming up for trial December 4th, 1902.

He had been seen by a number of competent physicians, who testified that when he entered the nospital April 15th, 1901, they found the signs of the old fracture, which the plaintiff had the effrontery to say was recent. It was ascertained that the patient's father had died of Bright's disease and his mother of brain tumor,

that there was no history of venereal disease, but that he had drunk for a long time to excess. The original fracture involved the upper portion of the right parietal bone, and in January, 1886, three months after the first accident, he suffered from double vision, difficulty in reading print, constant ischuria, tingling in the throat, unsteady gait, and a general tremor.

There were left hemianesthesia, dysphonia, exaggerated reflexes, and convulsive movements. The latter would occur unexpectedly when the trunk and legs would become the seat of spasm, the shoulder and neck being twisted to the left; and during this seizure he emitted a peculiar hissing noise. At one time his left arm was paralyzed and contractured. All of those who saw him, including Dr. Nammack, the visiting physician to Bellevue, emphasized the violence of the agitation, which they spoke of as a "tremendous" intention tremor. It certainly was the feature of the case. This man's condition had lasted seventeen years, and yet he had suffered no apparent impairment of his general health. He was well nourished, the temperature and pulse were normal, and he was rational; although, according to Dr. Hammond, somewhat dull in comprehension. It would appear that there had been some moral decadence, for his conduct was such that his family could not live with him, and his latest attempt at imposture in seeking to obtain damages for a condition due to a previous accident many years before confirms this.

The experience of many years is full of absurd cases of substitution, not the least ridiculous of which was that of a man who sued for an alleged injury of the face, alleging that an enormous nose, which was the seat of the rather rare affection known as rhinoscleroma, was an evidence of injury inflicted by the defendant a few months before, when in reality it was of syphilitic origin.

Many examples occur to the writer in which contractures and deformities existed that were so patent that there is every reason to suppose that no one could be deceived:

CASE LXIII.—Within a year or two in Brooklyn, a case was tried in which a carefully prepared diagnosis of amyotrophic lateral

sclerosis was made by a neurologist of experience, who testified that the spastic contractures of both knee-joints were the result of a degeneration of the spinal cord, and a prognosis was given that seemed reasonable enough that the man would never recover. Before the end of the trial, however, it was shown that he had in Russia, before his emigration to this country, inflicted bilateral wounds upon himself with a shoemaker's knife to escape military service, and the resulting deformity (due to severance of the hamstring muscles) had preceded the accident for many years.

A substitution case, exposed by Mr. Carrière, the quick-witted counsel of the Fidelity and Casualty Company, was that of a boy who claimed that a *talipes equinus* had been produced by an accident. When he was forced to remove the other shoe, it was found that the same deformity existed to a lesser degree, and in both extremities was due to an old poliomyelitis. Another case was that in which the characteristic deformity of the hand so often found among shoemakers was ascribed to spinal injury.

CASE LXIV.—A case of some interest in which the writer appeared was tried in one of the branches of the Supreme Court of this city several years ago. The allegation was made that the patient had sustained a serious spinal injury in the year 1895, having been knocked down by a horse attached to one of the defendant's cars and thrown beneath the platform. When the car was stopped he was removed and carried to a neighboring bar-room. He was found to be unable to walk or help himself; was not able to dress or undress, and the upper extremities were the seat of tremor and without power.

He subsequently was able to go to work as a nickel-plater, which had formerly been his trade. The testimony of his physician was that he saw him in February, 1895, and found a cut and bruises about the knee on the front of the left leg; that he put the patient to bed, who was so helpless and shaken he could not stand on his right foot, which, *however, was the one that was not injured.* (The doctor made no electrical or other tests.) The subject presented disturbances of co-ordination, being unable to stand

with his feet together; the knee reflexes were both exaggerated, and the functions of the bowels and bladder unimpaired. A distinct spinal kyphosis was ascribed to the accident, and alleged to be due to vertebral disease that had developed since. It transpired that the patient had had cerebro-spinal meningitis in 1894, with a temperature of 104° to 105° F., retraction of the head, and coma. He was ill in bed three months and slowly recovered, and that after his recovery, many months before the accident, there was weakness of both upper extremities so that he was unable to burnish, as he was required in the exercise of his trade, and was forced to abandon his work. It also transpired that the spinal deformity was of early origin, developing after Pott's disease in childhood, and of course had nothing to do whatever with his present condition.

CASE LXV.—B. F——, a healthy appearing man of about 60, sued a street railroad, alleging that before alighting from one of the defendant's cars it started and he was thrown against the curb. This was in December, 1899. When seen by the writer, two years later, there was an ankylosis of the right knee, and he walked with a cane. With this there was slight tremor of both hands, which was not pathological. He said that the day after the accident a lump appeared in the perineum, "which looked like an abscess," but disappeared in two months. There were immediate numbness of the left lower extremity, more on the outer surface, prompt incontinence of feces, and prolapse of the rectum. He was greatly shocked. In 1901 "his legs were so weak that he had to watch and place his feet"; no paralysis or atrophy was found, and no true affection of sensibility, yet he complained of "pains every minute." He walked better at times than others, especially when absorbed in his story, or when his attention was diverted. There was no evidence of relaxation of the sphincter ani, nor local anesthesia of the gut. In this connection he said: "When my bowels are very loose I don't feel the paralysis." And at another time: "I cannot walk because no volitional action takes place, because my foot does not convey the sensation of touch of the ground to my brain. When I walk more than a block, pain starts from my heel and is transmitted to my brain." In fact his replies were largely indicative of coaching and suggestion. The only objective appearance was the stiffness of the right knee-joint, which

impressed me at once as being due to an old injury, and it turned out that in 1856 he had had a fall of forty-two feet (?) in a building, and struck on both feet, losing the use of his right lower extremity, and there evidently had been some ulceration of the cartilage and local inflammation. This man, when not under observation, presented no indications of injury, except a slight limp, and his case was settled for a small amount.

Plaintiffs are often prone to claim that the symptoms of long-existing general disease are due to accident, and diabetes is one of these.

CASE LXVI.—The details of the case of an elderly man, who was seen by the writer, and who obtained an enormous verdict recently, is about as glaring an example of fraud as can be found. The plaintiff, a man of advanced years, claimed to have been thrown down and injured by one of the defendant's cars, and that in consequence the original "shock symptoms" developed in addition to diabetes; and it appears that when he was taken to the hospital, sugar and casts were found in his urine. Shortly before the trial it was ascertained that several years previously he had been in rather a serious railroad collision in another State, and had sustained grave injuries with traumatic neurasthenia; and at the time examinations of the urine had disclosed evidences of long-standing renal disease, which were unmistakable. His appearances upon the witness stand and in court, where he could be closely observed, were very suggestive that he had for a long time suffered from the disease, and there was little doubt in the minds of the experts that it had antedated the first accident, many of the symptoms of which were mustered up and made to do duty again by his disreputable lawyer.

It seems almost impossible that a disease characterized by so pronounced a deformity as a goitre would be unrecognized by those who coach a litigant, yet the following case is one in which a claim was made that the cardiac symptoms of Graves' disease were not connected with the thyroidal affection, but were ascribed to the in-

jury itself, and the plaintiff's claim was reinforced by other fraudulent misrepresentations.

CASE LXVII.—R. F——, a woman, aged 36, claimed to have been thrown from a street car, falling upon her back, in the year 1893. She was 36 years old, married eighteen years, and had six children, the youngest of which was ten weeks old. The immediate consequences of the accident were not serious, but when taken home she had a profuse hemorrhage from the uterus, and was curetted by her doctor. She complained of coccygeal pain, and an examination revealed an old fracture with filamentous union. She did not claim to have struck the end of her spine. She said she had pain over the liver and region of the gall bladder, and contusions about the hip, continued headaches, pressure upon top of the head, dizziness and palpitation, impairment of sight and saw "mixed colors." If she bent over she could not get up without pain in the back, many parts of the body were numb, and she could not sit in the regular way. Her doctor said that the uterus was painful to the touch, and there was some endometritis. Connection with husband caused great distress. She could not walk but a few blocks without getting tired, or climb stairs without shortness of breath and fatigue. There had been an alleged loss of memory, which did not appear to be genuine. She "could not hold water, but it dribbled from her and was red." An examination by the writer shortly after showed that she was rather pale, anemic, and badly nourished. The face was puffy and the eyeballs were prominent, more particularly the right; the pupils were dilated. Ophthalmoscopic examination revealed a congested condition of the retinal vessels. According to her physician she was "hypermetropic before the accident, but now myopic." The body was fairly nourished so far as muscular development was concerned, but the skin was generally pale. There was an old well-marked asymmetrical goitre; the pulsation transmitted strongly when pressure was made; there was a venous thrill over the jugulars; the pulse was 120 and intermittent; the hands were cold and rough, and showed evidences of constant daily use and more or less hard labor, though she claimed she did nothing. Pressure tests showed then that the vague pains were subjective; rectal examination revealed an old fracture of the tip of coccyx; there was no appearance or suggestion of inability to hold water,

no odor or wetting; the electrical reactions were good, and vague dysesthesia was present. There was a light tremor, particularly of the hands (about nine per second); this was continuous and observed throughout the examination. The tremor was alleged to have appeared after the thyroid development, which was improbable, as it is an early symptom of Graves' disease. In this case the goitre, which was easily noticed, had not attracted the attention of her physician or herself, and certainly antedated the accident.

SIMULATION.

It is almost unnecessary to say more about the frequency of this particular kind of fraud, except to enumerate various prominent symptoms that may be counterfeited with more or less success by dishonest litigants. Besides the list of vague subjective complaints which bear a family resemblance, but do not stand the test of even the most perfunctory examination, there are others which are more or less ingeniously presented by those whose success depends upon the aid given them by designing persons, or upon the sharpness of the impostor himself. It may be said, however, that a very intelligent person who tries to sham is often apt to make deplorable and inexcusable blunders, thus fulfilling the lesson of the familiar maxim in regard to a little knowledge. Most physicians are able to recognize the incongruous associations of symptoms, and the errors made in regard to the mode and time of development of real expressions of disease, but it is necessary as well to fix their intrinsic genuineness by proper test.

Motor Symptoms.

Paralysis, Contractures, Spasms, Tremor, the Reflexes.—With real paralysis there are consistent concomitants of which the simulator is usually unaware. Besides the

want of power we find in genuine paralysis vasomotor disturbance expressed in changes of color, and coldness of the surface and, perhaps, atrophy with contracture and reflex diminution or exaggeration, and alteration of the electrical reactions. If the simulator be watched, it will be found that there is an apparent variation in his loss of power, and if he is told to make some movement with the limb that he admits is not absolutely "without life," there will be an utter absence of any volitional effort whatever, and he may sometimes go so far as to refrain from moving the sound limbs. Certain forms are quite beyond his reach; among these are the paralysis of the ocular muscles and of the face. Not only would an attempt to simulate these meet with failure from their very characteristics, but it would be impossible to keep up a sustained effort for any great length of time.

The association of a corresponding expression of weakness with the characteristic attitude for any prolonged period is also difficult. It must not be forgotten that a person who may feign many other symptoms with some degree of success may quite readily present the fine tremor which belongs to functional nervous excitement, as an evidence of his anxiety, and it may be genuine enough. These persons as a rule perform actions in which the paralyzed muscles participate, and when off their guard will forget about their pretended disability. An apparently helpless old woman, to show her scars, will get out of bed with agility, using her paralyzed arm and hand perhaps to help herself; or the male suspect, after an examination, will pull on his drawers or put on his coat with no apparent effort. It has been the writer's experi-

at paraplegia, or a paralysis of one lower extremity, is ost often feigned, and that hemiplegia, being more diffi- lt, is not imitated so often. When it is, there are often spicious evidences of deception; the limbs in all forms paralysis rarely appear flaccid, but are held by the tient in the position in which they were placed by the ysician and are sometimes kept rigidly extended by the dingerer instead of falling to the ground. In hemiplegia ere is the ordinary circumduction of the paralyzed leg d foot and the dropping of the toes, and the anesthesia th loss of motor power is a consistent evidence of the nuine condition which is rarely copied by the impostor. napp has also suggested that the sole of the shoe is not rn at its inner and anterior part, as it in real hemiplegia at has lasted. Care should be taken to recognize the sterical element where no actual deceit is intended; the esthesia in such cases has peculiarities of its own to ich reference has been made in another chapter. It not likely, even if the simulator knew them he would tend to have them, preferring to copy a more serious ralysis.

As nearly all cerebral hemiplegia is preceded by some tecedent symptoms, and if it be right-sided probably aphasia, a case presenting itself in which there are no monitory or initial expressions of disease of the brain extremely improbable. To be consistent there should facial paralysis and deviation of tongue, and the paraly- itself should be on the side opposite the head injury. ne detection of feigned disease of course requires that mind should be free from any bias or feeling of sym- hy or pity, and the apparent circumstances of the sub- t should have no influence whatever.

CASE LXVIII.—A case which illustrates this occurred to the writer early in his professional experience; where mistaken sympathy for a man, who was apparently seriously wounded, led to undue carelessness. The patient was brought to the hospital in a helpless condition. He had received a bullet wound in the back while engaged in a burglary, and upon his admission apparently could neither move his legs nor feel the point of a pin. The bullet had entered near the sixth dorsal vertebra upon one side, but could not be found. While under observation there were no vesical or rectal symptoms, and he had no erections. After a stay of several weeks there was no pathological atrophy, and the electric reactions were good. Numerous consultations were held at his bedside, which he listened to, and he seemingly took a great interest in his case. He was finally carefully removed upon a stretcher to the jail, to be cared for by the physician of that building; and when he left us he apparently still could not move his legs. The night after his departure, however, he broke out of his cell, scaled a wall, dropped to the ground, and found his way to parts unknown. In this case there was every reasonable ground to believe the patient's case was a serious one, though the absence of some symptoms was suspicious and should have put us on our guard.

An alleged incontinence is occasionally claimed by litigants and, as a rule, this may be easily detected. The insufficiency of the anus and the atonic state of the lower bowel may be easily recognized by passing the finger into the gut, when the contractile power of the sphincter will be found to be impaired or lost, or that the parts will be anesthetic, a condition of affairs which cannot be shammed by the impostor. The latter may sometimes voluntarily pass well-formed feces in the presence of the examiner, meanwhile making a great parade of his alleged weakness. Incontinence of urine upon the part of the simulator is often also voluntary, as has been shown on another page (Case LX.). The subject of real incontinence will not only give forth the am-

moniacal odor which often depends upon the escape of residual urine, or that which decomposes in contact with the clothing, but there will usually be found some redness of the skin, or other evidences of irritative action. A popular test which is generally recommended in suspected cases is carefully to dry the meatus with absorbent cotton after the patient has emptied his bladder, and then attentively to watch the locality; and should dribbling occur it is probably due to a genuine incontinence.

The simulation of *contracture* seems to be more or less general among malingerers, but here too it lacks the characteristics of true disease, and the subject is apt to assume positions which could have no reasonable pathological explanation. It is usually connected with some assumed paralysis, and is always more extreme under observation, and if caught off his guard the patient is quite likely to resume his ordinary position. Organic contracture due to descending neuritis is associated with increased reflexes and shortening, which, of course, cannot be assumed, and in genuine cases such contractures do not disappear when the person is rendered unconscious, for they are usually dependent upon actual structural alterations. It is also impossible to feign the contracture of peripheral paralysis, for in the latter the reaction of degeneration will be found. Temporary voluntary distortion of the extremities, usually with some form of hyperextension, may be of feigned origin.

CASE LXIX.—The case of Kennedy vs. The Metropolitan Street Railway is of such interest in showing feigned contracture and paralysis, as well as other alleged symptoms, that it may be noted at some length.

The plaintiff had been thrown from a cross-town car by a collision with a car of the defendant's line at Fourteenth Street and Broadway, April 24th, 1896, and was picked up unconscious and taken to the New York Hospital, where he remained two days, and was then removed to his home in Jersey City. He first noticed a loss of power at the hospital: "falling back when he attempted to rise from his bed." He was not aware of the period of unconsciousness, but remembered being examined by the surgeon and being removed to Ward K. He stated at other times that his paralysis commenced in the carriage, on his return to Jersey City, and afterward that it was not until he reached home that there was loss of power.

His physician stated that he treated the plaintiff from April 26th last to the present time, and had seen him frequently. He had found marks of injury, that the patient had pain, and on the 26th became paralyzed on the left side, with no loss of consciousness. He also stated that the patient had subsequent nose-bleeding and convulsions, the latter being confined to the right side of the body, and not involving the left arm or leg. The man, according to the doctor, had subsequent fits, always preceded by nose-bleeding. The left leg had improved somewhat since the accident, but not the arm.

When I went to his lawyer's office to examine him, he was notified, and entered the room, moving with apparent difficulty, and holding his left leg stiffly. The gait in no respect resembled that of hemiplegia, there being no loose motion of the lower extremity and no dropping of the toes. The left upper extremity was likewise apparently affected and rigidly fixed.

I noticed once during the interview that the whole upper extremity was rotated so that the thumb was backward and the palm was outward; but, as a rule, the palm was pressed tightly against the thigh; there were no unequal contractures, no extension of the foot or flexion of the forearm or of the fingers, which belong to true paralysis, but that all the muscles of the leg, thigh, forearm, and arm were apparently equally contracted, and I judged such contraction was purely voluntary. He manifested a great deal of strength upon the right side; but when told to make an effort with the left, there was apparently not the slightest attempt upon his part to do so, for when the arm and forearm were grasped there was no muscular action whatever, though the muscles them-

selves were of good volume and apparently of normal size, and there appeared to be no evidence that they were not continually exercised. I was impressed with the strong contraction of the adductors of the arm, such an exercise of force, in my experience, being unknown in any form of paralysis; but upon one occasion during the interview this was remitted, showing that it was not permanent. The knee-jerks and wrist reflexes were not exaggerated, as they would be in degeneration and contracture.

Examination of the head disclosed no scars, no depression of skull, or external injuries. The face was flushed, and the ears were equally warm to the touch. There was no facial paralysis, the buccal line being straight; the pupils of both eyes were symmetrically dilated and acted well to light. Examination with ophthalmoscope revealed no changes indicative of disease, and the tongue was protruded in a straight line and did not tremble.

No marks of old epileptic scars were found on the tongue or elsewhere; the color of the skin of the alleged paralyzed arm was healthy, and the temperature of both hands was apparently equal and not lowered. His pulse was rapid and beat 140 a minute, circumstances which I attributed to his excitement.

He was demonstrative and courted painful tests, inviting me to apply the battery or run pointed instruments into his body. One other complaint was that he was without feeling upon the left side, and that the limit of insensibility, as fixed by him at my request, was determined by a line which ran from the shoulder down the left side and backward, corresponding below to a point indicated by the crest of the ilium.

It was shown that during the time of his alleged helpless condition he went to a pool-room and played. That he marched with a target company, holding a gun with his "paralyzed" hand. During the trial I had the chance to observe his unconscious actions; and my diagnosis of malingering was confirmed by his limping with one leg one day and the other the next, while on a third occasion he used all of his extremities in a perfectly natural way.

The superficial and deep *reflexes*, being involuntary phenomena, are beyond the reach of the simulator, and though he cannot control them, he may, if posted, pretend to have exaggerated knee-jerks and kick sometimes

before the blow is actually made upon the patella tendon. If he be blindfolded, however, he is not apprized of the impending blow, not knowing when it is to be made and therefore abandons his attempt. Bailey has called attention to the fact that when the person sees that the test is to be made, an appreciable interval elapses between the receipt of the stroke and the movement he consciously makes which is due to the formation of the voluntary impulse.

The subject may try to restrain the knee-jerk, but the voluntary contraction of the flexors is readily perceived when he makes the attempt. If the deep reflexes cannot be evoked and there is no evident effort made to suppress them, it can be taken for granted that (if it is not an exceptional case in which they are naturally absent) the patient is not trying to impose upon the examiner. The superficial reflexes, so far as inactivity is concerned, are always beyond control. In cases of disease in which they should be absent, that is, where there is peripheral anesthesia, there ought to be a consistent loss or, as Bailey says, "if they are not lost in places alleged to be anesthetic, it should excite suspicion of shamming." The *ankle clonus* cannot be simulated. *Tremor* cannot be feigned for any length of time with success, and always lacks the rhythm found in real disease. It is of course possible by the application of the finger tips or toes to an unyielding surface, or by the assumption of a strained position, to produce a kind of tremor, but this stops when the strain is remitted. When manifested in traumatic cases it is a question whether it has not preceded the alleged accident or is not a manifestation of advanced age, or possibly an habitual or family peculiarity; perhaps, too, it may be

found in a person who drinks, and individuals of this sort are apt to press it into service in support of their claims. It is rare that paralysis agitans is feigned, and if so, it is difficult to see how the malingerer could at the same time feign the festination or successfully counterfeit the facial expression. Convulsions with or without loss of consciousness and like disturbances are not so commonly feigned as might be supposed. Sometimes the paroxysms of hysteria are so intimately associated with the states of mental perversion, and so easily induced as to lead to the suspicion of duplicity; but the general history of the case, if obtainable, favors the formation of a reliable estimate of the patient's responsibility.

Fortunately in this country there are few of these subjects who apparently have convulsions to order, as in the French hospitals, and grave hysteria is rare. In both male and female subjects the attacks can be often aborted by making firm ovarian or testicular pressure, a method that may be adopted as well in ordinary malingering; so the diagnosis should be easy.

The true *epileptic paroxysm*, if at all severe, is expressed by a tonic and clonic stage of severe convulsion, tongue-biting, perhaps involuntary discharges from bladder or bowels, lividity of the surface, characteristic stertor, foaming at the mouth, insensitiveness of the pupils, and post-convulsive reflex loss. In some cases there are petechiæ. A significant feature of true epilepsy is that the paroxysms rarely occur in the presence of other people, and it is not usual for the physicians to see a patient in a convulsion unless at a large special epileptic hospital, or occasionally in a crowded street. The simulator, apparently, in the vernacular, is ever ready to "throw a fit" but takes good

care not to injure himself. These impostors nowadays rarely put soap in the mouth to produce foam, and if they do, the deception can be readily detected. Old epileptics are apt to present certain marks of the long-standing disease, such as the facial expression, the vasomotor changes, the existence of old tongue and scalp marks left after wounds produced in previous attacks, and sometimes mental dulness as well as the stigmata of degeneration are present. In doubtful cases of paralysis or contracture, resort may be had to such anesthetics as nitrous oxide gas, or ether, which should be pushed only to the point of commencing mental confusion, when the simulator will, under such circumstances, be apt to use his arms and legs in a struggle to avoid their further administration, and perhaps walk, when for a long time he has carried on a successful deception. These agents are also useful in clearing up certain imitated forms of gait or pretended titubation, such as was adopted by the murderer Ennis, who was lately executed at Sing Sing, and in prison had simulated paresis. It is sometimes difficult to judge accurately of the degree of alleged simple muscular weakness, and this is possible only through careful observation, or the use of the dynamometer which is to be used by the suspected person, who should be first blindfolded.

Sensory Symptoms.

Pain, Anesthesia.—The existence of real pain, which is the most common and oftenest feigned subjective complaint, is often determined with difficulty, for its reality and extent must depend in great measure upon the truth of the patient's statements. Our knowledge of the ord

nary manifestation and causation of this symptom, its association with other evidences of disease, and its effect upon the behavior of the individual is happily of use in estimating its reality and extent; and it is at such a time when experience and common sense count. The pain of the malingerer is always more or less associated with some exaggeration of the emotions, and it may be easily diverted in some subjects by simple suggestion, to reappear in a new place. If seemingly constant and superficial, it may not correspond to the distribution of well-known sensory nerve fibres, or with the location of some underlying organ. The facial expression is often not that which belongs to real suffering, and the physical condition does not indicate strain or exhaustion. In this respect it resembles the fictitious insomnia which is so often claimed to exist and in no way impairs the subject's vitality or physical condition.

In this connection reference may be made to the so-called Mannkopff test, which is more or less reliable in those cases in which severe localized pain is alleged. The success of this test depends upon the fact that if pressure is made upon a definite tender point it will cause an acceleration of the pulse of from fifteen to twenty beats. Care should be taken to make the test without the patient's knowledge, or else the incidental nervous trepidation will excite him and cause an ordinary emotional quickening. At best it cannot be regarded as an infallible test in every case.

Anesthesia.—The malingerer, especially if he be coached, can feign a loss of tactile or pain sensibility, but is usually unable to sham thermic anesthesia. Through training, or because of an attribute of low organization,

certain individuals may undergo a great deal of torture without any apparent suffering. During the trial of the Bolte case, the writer sent for a professional known as the "Human Pin Cushion," who would allow needles and other sharp things to be thrust through his skin, or who would stand the strongest application of the induced current without evident discomfort, and he afterward heard of numerous imitators of this person who could be engaged for a reasonable consideration.

In this connection attention is again called to the auto-suggested anesthesia which may be induced in those who have religious or other ends in view. The simulation of anesthesia is difficult because if there be no actual condition of insensitiveness the subject is unable accurately to respond to repeated tests and give consistent answers.

If, for example, the surface of the trunk is chosen, the limitation of the alleged loss of sensation may be found and marked by a pencil of one color, a line being drawn at the point where feeling is said to disappear abruptly. At the next and succeeding trials different colored pencils are used, and at the end it will be found that the lines of limitation will be found to vary. The subject should, of course, be blindfolded through all this. Sudden surprises by means of unexpected pin pricks, electrical applications, and the dashing of hot and cold water on the surface will sometimes cause an impulsive exclamation, or movement to get out of the way. A sudden increase in the strength of the current in the course of an electrical examination which has been conducted in a guarded manner, avowedly as a test for the muscular condition, will cause him when off his guard to betray himself, or when testing tactile sensation with a camel's-hair brush

a concealed needle or pin may be pushed down suddenly, when he may cry aloud. Sometimes the mere exhibition of the actual cautery will discomfit the malingerer.

In conclusion it should be borne in mind that the ignorant impostor will not be able to know the correspondence between the limit of feeling that should exist with relation to definite areas of nerve supply, which are known to the observer, who also is familiar with the peculiar hysterical variations.

In regard to the recognition of heat and cold, the hysteric or simulator will often feel perfectly the hot and cold body, where the thermic sense would naturally be affected, while on the healthy side he will make all manner of intentionally foolish guesses. It has been suggested that the unexpected application of very hot or cold water will elicit complaint. Great care must be taken, however, not to mistake the *pain* for the thermic sense.

Insanity and Unconsciousness.—The selection of mental disease for simulation by persons who plead irresponsibility for crime, or who are perhaps engaged in extortion for fancied injuries, is in some degree a matter of fashion, the records of the New York criminal courts for the past two or three years containing many cases of this kind, some of which were undoubtedly feigned; but in previous years the cases were only sporadic.

It does not appear that feigned insanity has been at all common in accident cases. Knapp refers to a boy who simulated dementia, and I have seen several persons who among other things claimed an utter loss of memory. The complaints of most of the plaintiffs are more general so far as general intellectual failure is concerned, and it is difficult to portray at length the inharmonious expressions

of the simulator. If watched continually, his conduct will be expressed by wide variations; he is usually intent on the outcome of his performance, and will break down when subjected to too close an inquisition. The preconceived idea of what constitutes insanity upon the part of an ignorant man or woman is usually one that will lead them to indulge in a disorderly lot of manifestations, and they are apt to overdo the part. Even when such a person has been before thrown with insane patients, and he may have acquired a few tricks of manner and gesture, and may possibly counterfeit some of the motor symptoms, it should be easy for the skilled examiner to appreciate his inconsistent answers, for they do not form a part of a clinical entity.

Noisy and disorderly conduct and self-defilement is the popular idea of what constitutes insanity, and acute mania is simulated by people who meanwhile eat and sleep and do not lose flesh, and who stop in their outbursts covertly to watch the effect produced upon the by-stander. There is often a sudden change to new topics preceded by a period of reflection. In fact, there are none of the well-known and harmonious indications of mental disorganization which are familiar to the students of psychiatry. Suggested symptoms, no matter how absurd, are adopted, portrayed, and repeated as if they were looked upon as good things. In this connection a word of warning must be conveyed in regard to the danger of misjudging the hypochondriacal insane, or those with sensory hallucinations or delusions who are quite apt to feel many of the things they are told to. Total loss of memory is often claimed, which is so profound as to be unreal. In some instances the dishonest subject will, in

apparently trying to remember, give some absolutely silly but positive answers. This is especially true as to numerical matters, questions of situation, and identity. If asked where he was upon the morning of the alleged accident, he may reply: "I was in New York until ten o'clock, and in Pekin in Asia at from P.M." Again, if asked "How old are you?" he may reply "Thursday," and immediately after, in answer to the question: "What day of the week is it?" will reply "Thirty-five." Even the most confused or incoherent lunatic would not answer in this way. At this point it may be said that certain of the insane, especially those who present the symptoms of one form of traumatic insanity, manifest what are known as hallucinations of memory, or *paramnesia*, which leads to the apparent fabrication of lies regarding alleged previous incidents of their lives, but this can hardly be mistaken for the above absurdity of reply. There is usually too much method in the madness of the malingerer. As under other circumstances it is far easier to feign depressed states or limited insanity, but even these may be detected with tolerable ease if time is taken. The simulation of another kind of insanity by the mentally unsound is well recognized by psychiatrists. I can remember but one case of this kind in which it was done for the purpose of imposing upon an examiner.

CASE LXX.—The subject was a young Polish doctor, aged 29, who through great self-sacrifice had educated himself and secured a degree, but found it difficult to get practice, and in consequence suffered from ill luck and poverty.

For some months previous to October, 1899, he had run down in health, become depressed and melancholic, and had threatened suicide. There had been no stuporous condition or delusions. At the suggestion of his physician he took long rides in a light wagon,

provided by his family, and upon the occasion of the accident (which was on October 3d) he had gone to New York from his home in Brooklyn. In attempting to cross the railroad track on Sixth Avenue his wagon was run into by a car, and he was thrown out, striking his back against a column of the elevated railroad structure, and sustaining slight abrasions and some shock.

There seem to have been no serious immediate effects except these and a transitory unconsciousness. When he was taken home his depression increased, but he was not thought to be too ill to be allowed to go about; and at the time of the writer's unexpected visit a one-horse vehicle was waiting for him outside of his residence. He was found lying upon a bed *fully dressed*, and presented an apparent cataleptic rigidity, with his eyes firmly closed, and *he resisted attempts to open them.* There was considerable apparent, but not real flexibilitas cerea at the elbow- and knee-joints, with some *voluntary* effort at resistance when passive movements were made. When not watched he opened his eyes, and apparently *noted the movements of others, but closed them tightly whenever approached.* The deep and superficial reflexes were both slightly exaggerated, and there was general hyperesthesia, more over the back than elsewhere. The circulation was poor and the hands were cold. When the induced electricity was applied to the surface he did not complain, but when he was blindfolded and *mild* currents were applied, he kicked, struggled, and cried out. He voluntarily placed his hands and arms in an apparently cataleptic position when watched, and contracted his fingers. When a drop or two of chloride of ethyl was applied to the surface without his knowledge, he started violently and became agitated, as if about to have convulsions. When watched quietly, he made silly faces and presented the "Schnautz Krampf," or again opened his mouth and shut it automatically, or sighed deeply and groaned as if in pain. When told to put his tongue out he said, "I can't." It appeared that he talked to his mother and other persons, immediately before our visit, in a rational manner, but feigned muteness in the presence of the examiners alone. At one stage of the examination, which extended over a considerable time, he feigned hiccough. Pulse at the beginning 84, at the end 96. He slept well.

There is every reason to believe that this man suffered

from an initial simple melancholia, and the subsequent variations in his conduct indicated that he simulated a rather inconsistent katatonic state, which was confined to the time of our examination. As he was a person of some education and shrewdness, he overdid the part, although he impressed many with the fact that his insanity proceeded from a trauma, which it certainly did not.

We may avail ourselves of agents which upset the self-possession of the impostor, and any one thing will often destroy his reserve and set his tongue free, when the mask is dropped. Even in genuine cases of insanity the writer has sometimes been in the habit of using nitrous oxide or other agents as a diagnostic measure of diverting the narrow play of ideas or absorbing delusions, as the result of a habitual trend of diseased thought-mechanism, and with some success.

CASE LXXI.—Punton, of Kansas City, reports in full the case of a man who seems to have imposed upon a number of physicians in the Southwest, and who had deliberately gone about to victimize a railroad by feigning a condition of mental aberration, which was pronounced by his own physicians to be a mixture of "idiocy, dementia, and insanity," following a concussion, and primarily due to a blow received at the back of the head.

There had been an immediate loss of consciousness, convulsions, and aphasia. "He was compelled to be nursed and treated as a baby for the rest of his life, was wholly oblivious of his surroundings, had been deprived of all mental life, and he was living a vegetative life, for all of which he was entitled to serious damage"; in which latter conclusion the jury seemed to concur, and Hoskins, the plaintiff, received a verdict of $35,000. It subsequently leaked out that a lawyer, who had kept silent during the trial, had some time previously been approached by the man and his mother, who had sounded him about the amount of damages that an enterprising young man might receive should he happen to be in an accident that might cause him to be unconscious, "and become

like an idiot, or lose entire control of his mind." It is unnecessary to say that the counsellor told the mother "that he would not take such a case for all the gold that could be dug out of the ground, and that he warned her not to undertake it," but, undaunted, she left, saying that "her mind was fully made up to try it, and that she would consult some other lawyer." Subsequently the man was put under ether by Dr. A. C. Waller, of Fort Worth, and after *a mauvais quart d'heure* of active and persuasive methods, when an operation was suggested, he quickly broke down and confessed his deception.

Upon being called to see a patient having a claim, we may find him apparently unconscious or oblivious to what goes on about him, and sometimes it is even claimed that such states have lasted for months or even years (see Case XIII.). If hysterical or cataleptic, there are usually sufficient data upon which to make a diagnosis, and then there should be no difficulty in telling whether a person is really comatose or not.

The Whittaker case, in which the writer appeared, is an apposite *cause célèbre*, and has a bearing upon those examples in which it may be claimed that an accident or assault may lead to a condition of unconsciousness.

CASE LXXII.—Whittaker was one of the few colored cadets who went to West Point, and one of the least intelligent. He had repeatedly failed in his studies, and upon the eve of an examination, which undoubtedly would have resulted in his suspension, he made a desperate attempt to gain the sympathy of the country, as well as the opportunity to secure time for extra study. As the medical adviser of the Government I had ample opportunity to examine not only the record of the court, but made a personal visit to his room at West Point. The defendant was found early one morning in his dormitory, in an apparently unconscious state, bound to his bed with strips of cotton cloth. His eyes were closed and his pulse showed nothing unusual. There were slight cuts—one upon the left ear and the other across the great toe.

He remained apparently oblivious of his surroundings and of the people about him for some time, and finally opened his eyes, and in a dazed condition expressed great astonishment. From his story it appeared that he had been surprised *several hours before* by a body of masked men, who felled him to the floor, bound him, and cut his ears and toe, and then after threatening him left the room. The medical witnesses for the defence were of the opinion that the threats of the assailants, the fears of the victim, and the excitement had resulted in the production of a trance.

Much carefully given evidence effectually disposed of this fanciful theory. It was proved that none of the wounds was of a serious character—in fact, they were all painless and trivial, and unattended by hemorrhage; that on the toe hardly severed the skin. They were in a position where he could have made them himself, and the presence of a razor and a looking-glass on the floor near by strengthened this belief. No marks of violence resulting from a struggle were found; and the bandage was so loosely applied, and so flimsy, that he might have readily applied it himself; in fact, a young officer went through the process of tying and untying himself, as Whittaker had probably done. The room in which the alleged assault had taken place had numerous openings communicating with other apartments, in which many cadets were at the time, and any disturbance would have been heard at once. A prominent feature of the case was the production of a "letter of warning" to the prisoner, which, it was alleged, was written by Whittaker, and this drew forth a fight between the experts in writing. It appeared after the trial that the writer had carried on a regular correspondence with a woman friend; and in the opinion of the experts the letter of warning was in her handwriting, and had probably been prepared for the occasion.

Visual and Ocular Defects.—In the examination of all persons who present themselves claiming injury to the apparatus of vision, it is important to search for evidence of old disease, not only of iritis, but to detect forms of congenital weakness which are occasionally put forward as traumatic sequelæ, and at the same time to differentiate between the simple asthenopia and visual failure, or

weakness due to some more serious cause. So far as the writer's experience goes, the dishonest litigant rarely feigns any serious form of ocular trouble, and his complaint is usually that he "cannot use his eyes for any length of time without fatigue," that when he tries to re-

FIG. 35.—Derby's Stereoscope.

he "grows dizzy" or "that the letters appear blurred." Of course these are vague and difficult to determine at times, but usually, like other subjective complaints, are disproved by some inconsistency in conduct. When the simulator who is blind in one eye presents himself simple tests are available that are usually sufficient. If, for instance, pressure is made at the external angle of the

pretended amaurotic eye and he sees two objects, there can be little doubt that he is a fraud.

Much of the success of all ocular tests depends upon the precautions taken by the examiner, and by his self-possession, especially when the subject has been coached, or has studied up the subject in the medical books in a public library. For the determination of feigned blindness, plain and colored prisms for Graefe's test must be provided, perhaps a stereoscope, and the ophthalmoscope by all means. If a prism of 10° to 15° be placed in front of the sound eye, the base being upward or downward, and the person is told to look at a candle flame or some small, well-defined object, and if he sees two images, there is clear proof of fraud, for the alleged blind eye must be used. The test may be carried further by rotating the prism, when the reflection will be found to correspond with its changes in position. Bearing in mind the fact that in the stereoscope the axes of vision converge in the normal individual, we know that if there is really blindness, this will be impossible. If two different outline figures, a square and a circle for instance, be drawn on the card, they will be superimposed under ordinary circumstances. Kugel's method consists in placing transparent glasses of different colors before each eye, and then a colored opaque glass is held before the good eye, and at the same time a transparent glass of the same color is held before the alleged sightless eye, when if he sees the object he is simulating.

Total blindness of both eyes is rarely feigned, and if so with poor success, for the impostor can rarely keep up the appearance and counterfeit the actions of the really blind person. If the pupils be stimulated by artificial

light they will contract, while the patient may maintain his inability to distinguish light and darkness. What is known as consensual action takes place when a beam of light is thrown into the sound eye, when the pupil of the alleged blind eye will promptly contract. Although simulators are apt occasionally to dilate the pupils with atropine or belladonna, such dilatation will be more more excessive than when a real amaurosis exists.

A method of detecting feigned amaurosis has been used by French military surgeons, by means of the "box of Flees." The subject is made to look into this box, great care being taken that both eyes should be kept open, and that at no time during the experiment should he shut one. When under these conditions he has looked in, and he is asked what he has seen in the bottom of the box, his reply is interpreted in accordance with the arrangement of the apparatus at the time. He may tell us that he sees "a white wafer at the bottom of the box on the left side." Now if we examine the construction of the box, we find that the white wafer, *B*, which, owing to the reflection in a mirror, appears to be situated to the left at *B'*, in reality can be seen only by the right eye. The left eye, on the contrary, can see only a red wafer *R*, apparently situated to the right at *R'*. In a word, the apparatus is constructed in such a way that one eye can see nothing but the object

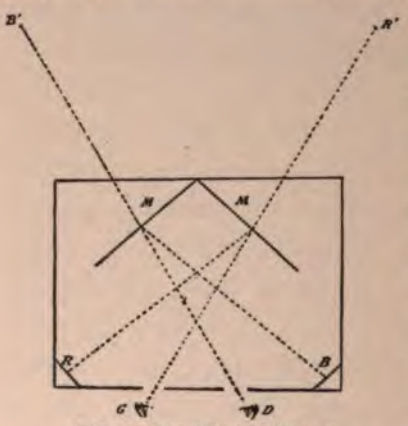


FIG. 36—The "Box of Flees."

which is apparently on the opposite side (Raymond and Janet).

The ophthalmoscope and perimeter should be used for the purpose of determining the condition of the fundus; and in these instruments we possess aids which are of considerable value, for with the former we may detect the existence of neuritis and atrophy should they exist. Like the cutaneous test of anesthesia before referred to, the perimeter will reveal the inconsistency in the patient's statement, for the outline of a feigned concentric limitation as Oppenheim and Knapp have pointed out, is unique and absolutely unlike that obtained in a case of real disease. Again, in connection with simulated blindness, we must not forget that the phenomenon of word-blindness, which is dependent upon a central lesion, may occasionally suggest fraud of which the patient may be perfectly innocent, when he says that he cannot read written or printed words.

Hysterical blindness, which in one way is real enough, may also be detected by the perimeter, and it usually exists in connection with the other stigmata of the disease.

Hearing.—The ordinary malingerer of course presents no evidence of local disease, and, as Knapp has shown, is unable to distinguish between vibratory sensations which are conveyed to his sense of feeling by loud noises, and those which are brought to his sense of hearing by the same noises, and he will often deny any sensation whatever. Unexpected noises, or questions calling for a reply, or questions asked when he is under the influence of drink or anesthesia will call forth responses.

In another way the unreality of the alleged loss of hearing may be determined by an involuntary exclama-

tion; by asking a series of questions at first in a loud voice, and subsequently gradually lowering the same without attracting the subject's attention, and meanwhile getting answers. In a case of the writer's, when a woman pretended deafness, it was possible by a few questions to arouse all her ire, so that she found her voice and burst forth into invective. There are many ways of doing this besides making the person angry, which will doubtless commend themselves to the resourceful examiner.

In some cases we may avail ourselves of an instrument called the phonendoscope, or a stethoscope supplied with long rubber tubes may be utilized. The success of the test depends upon closing the tube going to the sound ear without the patient's knowledge. If he still hears taps or scratching of the instrument, there is but one conclusion to be drawn—that he is trying to deceive. In a recent case in Brooklyn, where a plaintiff claimed deafness in one ear, his counsel asked him if he heard a watch which was approximated to either ear. On the "sound" side there was no difficulty, but in the "deaf" ear he naturally heard nothing until it was brought within a few inches of the side of his head. The opposing lawyer secretly removed the works from a case with which he tried the same test, *and with the same results!*

Mutism.—Malingerers very rarely try to imitate the disturbances of speech which belong to organic disease, and if they do usually come to grief. Sometimes, but not often, they are able to keep quiet long enough to deceive a person in a short examination; especially when fortified by the falsehoods of those about them.

Of course, conditions of aphonia, especially if hysterical and accompanied by emotional disturbance, may often

lead one to do injustice to a person who presents few of the other stigmata of that disease; and whose semi-voluntary vagaries of conduct suggest deceit. If hysteria is suspected the application of static electricity, or the wire brush connected with the induction coil, may cause prompt disappearance, when the patient will suddenly find her voice. Feigned or absolute mutism cannot be kept up by a healthy person for any great length of time, especially if she be watched, but sooner or later something is said in response to a suggestion or as the result of an adequate stimulus, or the subject talks gibberish. Reference has before been made to the case of a woman who had been pronounced aphasic by a physician, and this plaintiff on the witness stand and elsewhere would not only indulge in diminutives and other affectations, but with evident purpose mispronounced words.

Simulated *agraphia* is, I believe, unknown, but the following may be cited as an allied species of fraud:

CASE LXXIII.—Mrs. H. C. D—— claimed to have been injured on March 7th, 1897, and stated that when getting off a car it started and threw her upon her buttocks, when "she heard something crack" and became speechless. She was picked up and put in a front seat of the car to continue her journey, "but could not speak or move." She was seized with a chill, and "could not fix her hat, which had become disarranged." Just before she left the car she had another chill. When examined a few weeks later she talked plainly and intelligently, but declared there were times when she could not talk at all. In asking her to write, she put "d" for "g," and always repeated this except when her attention was diverted, or when she was confused in the examination. She, however, wrote her name in which there were two "g's," and when this was pointed out to her, she expressed great chagrin and confusion.

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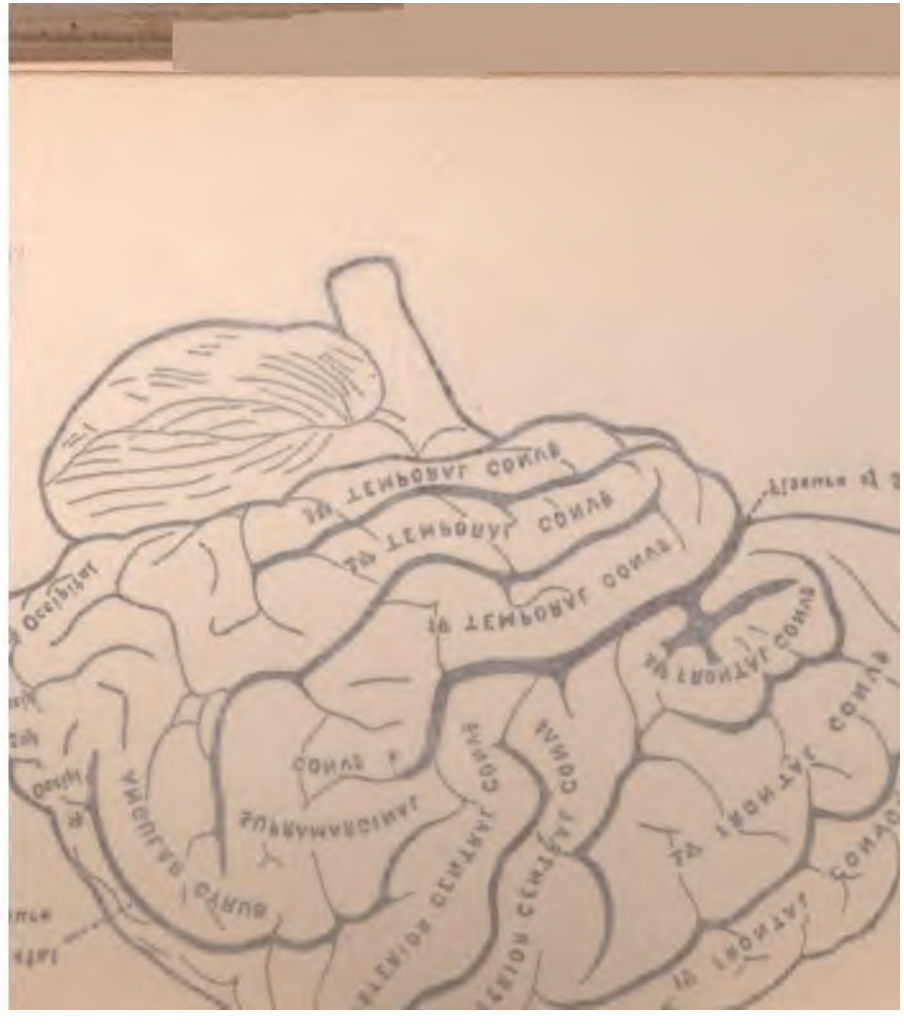
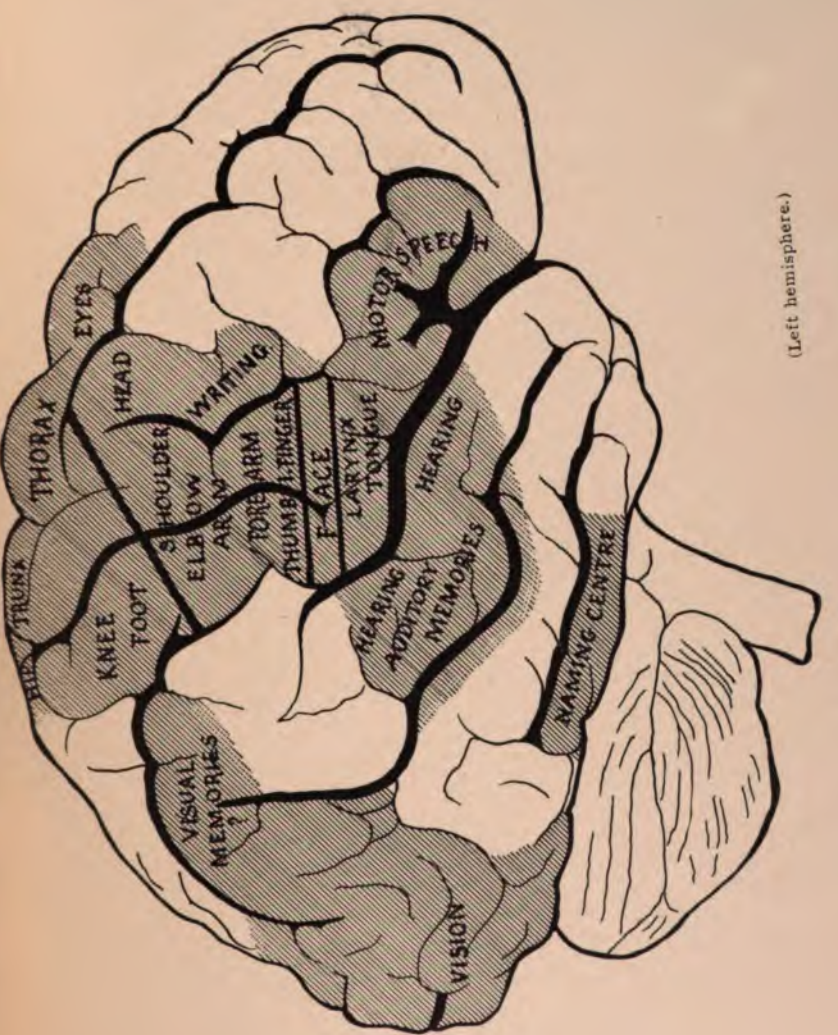


CHART I.



(Left hemisphere.)

3rd Frontal Convs
3rd Frontal Convs
1st Frontal Convs
1st Frontal
3rd Frontal Convs
3rd Frontal Convs
3rd Temporal Convs
3rd Temporal Convs
3rd Temporal Convs
3rd Temporal Convs
Gyrus Hippocampi
Gyrus Hippocampi
L. Fusiformis
L. Lingualis
L. Lingualis
L. Fusiformis
1
2
3
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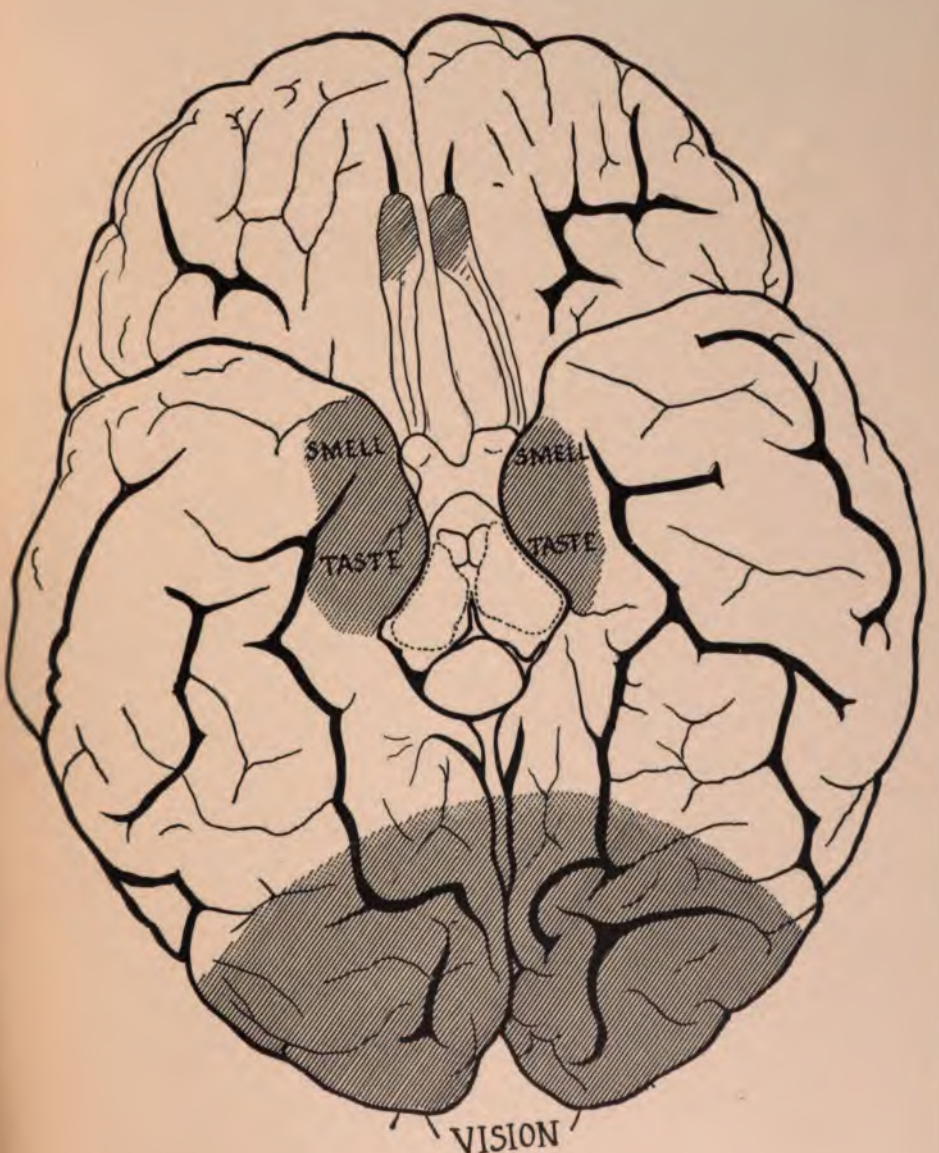
11
12
N
N
S

SMELL
SMELL
TASTE
TASTE
VISION

3rd Frontal Convs
2nd Frontal Convs
1st Frontal Convs
1st Frontal
3rd Frontal Convs
3rd Frontal Convs
3rd Temporal Convs
3rd Temporal Convs
3rd Temporal Convs
2nd Temporal Convs
Gyrus Hippocampi
Gyrus Hippocampi
L. Fusiformis
L. Lingualis
L. Lingualis
L. Fusiformis

VISION

CHART II.



GLOSSARY.

Aboulia: Without will.
Abrasion: Removal of the cuticle.
Accommodation: The action of the eye for the perception of objects that may be near or far.
Achilles jerk: Ankle clonus.
Ageusia: Loss of taste.
Agraphia: A cerebral loss of power to write, dependent upon a lesion of the "writing centre."
Akinesis: Without force.
Akinesis algera: Weakness due to the fear of movement and consequent pain.
Alalia: A speech defect of an atactic or paralytic kind.
Alexia: Word blindness.
Allochiria: Sensation felt in one member when the other is irritated; transferred sensation.
Amaurosis: Blindness.
Amblyopia: Dulness of vision.
Amnesia: Loss of memory.
Amyotrophy: Muscular atrophy, applied to a form of spinal sclerosis.
Amyosthenia: Muscular weakness.
Analgesia: Insensitiveness to painful impressions.
Anamnesis: A recollection.
Anemia: Deficiency of blood.
Anesthesia: Want of sensibility, insensitiveness.
Angina pectoris: A painful affection of the heart, due to degeneration of the coronary arteries.
Ankle clonus: An exaggeration of the deep reflex which is evoked when the Achilles tendon is stretched.
Ankylosis: Knitting together of bones through disease at their point of articulation, resulting in immobility.
Anode: The positive pole.
Anosmia: Loss of smell.
Aphasia: A speech disturbance. The term is usually applied to a defect in the motor centres of speech in the anterior and lateral part of the brain on the left side.
Aphonia: Loss of voice due to inaction of the vocal cords.
Apraxia: Loss of power of gesture communication.
Arachnoid: The middle membrane of the brain and cord.

Argyll-Robertson pupil: A symptom which consists in the failure of the pupil to react to artificial light, but to undergo alteration in connection with accommodation.
Arteriosclerosis: Hardening of the arteries.
Arthralgia: Pain of the joints.
Arthritic: Pertaining to the joints.
Asemia: An inability to understand any sign or symbol of thought, whether spoken, written, or acted.
Asthenia: Weakness.
Asthenopia: Weakness of vision.
Astigmatism: A state of irregular refraction in the eye.
Ataxic aphasia: A disturbance of speech depending upon inco-ordination of the muscles of articulation.
Ataxia: A disorder dependent upon muscular inco-ordination.
Ataxiagraph: An instrument invented by Dana to measure the swaying movements of the patient.
Atrophy: A wasting.
Atropine: The alkaloid of belladonna.
Aura: A subjective sensation preceding an attack of epilepsy.
Automatism: The habit of subconscious action.
Autotoxis: Self-poisoning.

Babinski reflex: The dorsal flexion of the great toe as a result of irritation of the plantar surface.
Bacillus: A rod-like micro-organism.
Basal: Pertaining to the floor of the skull or inferior part of the brain.
Binocular convergence: Change in the axes of vision due to muscular disturbance of the eyeballs, so that the point of convergence is reduced.
Box of Flees: An apparatus for testing simulated blindness.
Brachycardia: Abnormal slowness of pulse.
Brachycephaly: A cranial defect in which the head is too short.
Brachial plexus: A network of nerve trunks formed by the junction of the four lower cervical and first dorsal nerves and terminating below to form the median, ulnar, musculo-cutaneous, musculo-spiral, and circumflex nerves.
Bronzing: A brown color of the skin due to the deposit of pigment.
Buccal: Pertaining to the mouth.
Bulbar symptoms: Those depending upon lesions of the medulla oblongata.
Bulla: An eruption of vesicles.

Callus: A substance formed about the ends of broken bones for their support and facilitation of union.
Carcinoma: Cancer.
Cardiac affections: Those of the heart.
Caries: Inflammation with destruction of bone.
Casts: Evidences of disease of the kidney found in the urine.
Catalepsy: A state of unconsciousness with peculiar rigidity of the joints; probably a form of hysteria.

Cathode: The negative pole.
Cauda equina: The extreme lower part of the spinal cord, named from its resemblance to a horse's tail.
Centrifugal: Flowing from within out.
Centrum ovale—See plate V.
Cephalalgia: Head pain.
Cerebellum—See plates V., VI.
Cerebral: Pertaining to the brain.
Cerebral tension: Increase of blood pressure in cranial cavity.
Cervical: Pertaining to the neck.
Cervical vertebræ: Those of the neck, the first seven.
Cheyne-Stokes respiration: A state of irregular breathing characterized, first, by entire cessation for some time, then by an almost imperceptible return of respiration, and finally by violence and quickness, subsequent subsidence; all of this occurring perhaps within a minute.
Chiasm: The decussation or crossing of the optic nerve fibres.
Choked disc: A swollen condition of the optic nerve due to compression.
Cholin: A toxin derived from decomposition of lecithin as the result of the destruction of nerve tissue.
Chorea: A spasmodic affection; St. Vitus' dance.
Chromidrosis: Yellow sweating.
Cicatrix: A scar.
Circus movements: Associated with disease of the cerebellum, which cause the subject to turn when walking or to fall in certain directions.
Clonic: A term applied to a spasm characterized by interruptions and varying muscular contractions.
Cocci: Spherical forms of bacteria.
Coccyodynia: Pain in the coccygeal bone at end of spinal column.
Color sense: The faculty of distinguishing colors.
Coma: Stupor.
Compound fracture: A fracture of bone with wounding of tissue and communication externally.
Compression myelitis: Inflammation of the spinal cord produced by actual pressure of displaced bones or thickened membranes.
Concentric vision: Constriction of the visual field.
Concussion: The results of shock or impact.
Cone-bulging: A peculiar change of position of the skull or membranous sacs containing cerebro-spinal fluid, as the result of force applied at a distant point.
Condyles: Bony eminences for articulation.
Conjugated: A conjoined movement; here used to express the direction of the eyes to one side or place.
Conjunctiva: Mucous membrane lining the eyelids and reflected over the front of sclerotic and cornea.
Contracture: A more or less permanent or recurring contraction, often connected with an organic change of the parts.
Contracted pelvis: A deformity resulting from premature bony union.
Contraction of visual field: Limitation of vision.

Contre-coup: Counter-stroke.
Contusion: A result of an injury, consisting usually of swelling without any superficial wounding; a bruise.
Contusio cerebri: Contusion of the brain.
Cord: Spinal cord.
Cornea: The concaval convex part of the eye in front of the iris and pupil.
Corpora quadrigemina—See plate V.
Corpus callosum—See plate V.
Cortex: The peripheral gray matter of the brain.
Cortical epilepsy: Epilepsy due to irritation of the motor centres in the convolutions of the brain.
Costo-spinal articulation: Articulation of ribs with spine.
Cremasteric reflex: A reflex shown by contraction of the cremaster muscle in the scrotum.
Crura cerebelli: The peduncles of the cerebellum.
Crural nerve: Large nerve supplying the muscles and skin upon the anterior part of the thigh and knee and the capsules of knee and hip joints.
Crusta: The upper part of the crus cerebri.
Crutch palsy: That form of paralysis due to pressure made in the axilla.
Cuneus—See chart I.
Curetting: An operation for the removal of tissue by scraping.
Cyanosis: A condition of blueness depending upon disturbances of circulation.
Cystitis: Inflammation of the bladder.

Decubitus: A bedsore.
Delusion: A false belief (see Insane delusion). Delusions may be *sane* or *insane*.
Dementia: A form of insanity the chief symptom of which is a loss of memory and the inability to receive fresh perceptions and form ideas. The important forms are those of early life, the senile, and the organic or secondary; the two latter are always incurable and progressive.
Dementia paralytica: General paralysis of the insane; "paresis."
Depressive insanity: Melancholia, stuporous insanity, atonic insanity.
Dermal: Pertaining to the skin.
Descending neuritis: A form which is the result of extension of disease in central parts.
Diabetes: A disease characterized by the appearance of sugar in the urine.
Diastases: Points of separation.
Direct electrization: Application of a current to the muscle to be excited.
Diplegia: Double paralysis—on both sides of the body.
Diplopia: Double vision.
Disassociation: Disaggregation; separation.
Disuse atrophy: Wasting from non-use of muscles.
Dolichocephaly: A cranial defect in which the head is abnormally long.
Dorsal: Pertaining to the back.
Dorsal vertebræ: Twelve bones composing the middle section of the spinal column.

Dorsum: Back.
Dural: Pertaining to the dura mater or external membrane of the brain.
Dyesthesia: Disordered sensibility, numbness, prickling, sensation of crawling insects.
Dynamometer: An apparatus for determining muscular force.
Dystrophies: Primary muscular atrophy of peripheral origin.
Dysuria: Difficulty in urination.

Ecchymosis: An escape of blood in the superficial tissues due to local injury.
Eczema: A skin disease characterized by a vesicular, pustular, papular, fissured, and exfoliated lesion, usually symptomatized by redness, itching, exudation, crusts, and desquamation. Eczema appears chiefly on the scalp, beard, genitals, hands, and feet.
Edema: A swelling or puffiness of the tissues (œdema).
Electrode: The terminal pole of a galvanic apparatus; an instrument to apply electricity.
Endometritis: Inflammation of the interior of the uterus.
Epigastrium: The region below the breast bone and between the right and left hypochondriac regions.
Epistaxis: Nose-bleed.
Erosion: A wearing away.
Erysipelas: An inflammation of the skin and subjacent tissue due to a specific bacillus.
Esophageal: Pertaining to the esophagus.
Etiology: Inquiry into cause.
Eustachian tube: A canal extending from the throat to the middle ear.
Exophthalmus: Prominence of one or both eyes.
Extensor longus pollicis: A muscle concerned in the extension of the last phalanx of the thumb.
Extradural: Outside the dura mater.

Facies: Facial expression.
Fauces: The upper part of the throat.
Festination: A gait attended by pitching forward upon arising from the sitting position.
Fibrillary twitching: Contraction of muscular fibres or a part of a muscle; vermicular tremor.
Fibula: The outer bone of the leg.
Fissura calcarina—See chart II.
Fixed idea: Persistent idea; usually applied to fixed delusion.
Flaccid paralysis: The form without rigidity.
Flexors: Those muscles which bend or flex.
Foci: Plural of focus.
Folie de doute: Doubting insanity; Grübelsucht.
Fontanelle: A space usually open in young children, which marks the union of various bones of the head, and is later closed.
Formication: Subjective sensation of ants or other insects crawling on surface.

Glans penis: Expanded and sensitive end of penis.
Glioma: A tumor composed of neuroglia.
Glossy skin: A shiny condition of the skin due to a trophic chang found with neuritis.
Glutei muscles: Those of the buttocks.
Glycosuria: The passage of urine containing sugar.
Goitre: A disease of the thyroid glands; Graves' disease.
Grand hysteria: Major hysteria.
Graves' disease: Goitre.
Gyrus: A convolution.
Gyrus angularis—See chart I.
Gyrus fusiformis—See chart II.
Gyrus lingualis—See chart II.
Gyrus uncinatus—See chart II.

Hallucination: A perception without a real object, of purely cerebra
Hematemesis: Vomiting of blood.
Hematomyelia: Hemorrhage into the substance of the spinal cord.
Hematorrhachis: An escape of blood between the membranes and the spinal membranes themselves.
Hemianesthesia: Loss of feeling on one side of the body.
Hemichorea: Clonic spasm on one side of the body, usually associa paralysis, the lesion being in the cortex of the brain.
Hemiopia: A condition of blindness of half the eye.
Hemoglobin: The coloring matter of the blood.
Herpes: A skin disease often associated with trophic disorders, ne and residual pain.
Herpes zoster: An encircling crop of herpes.
Homonymous: A symmetrical lateral condition; a lesion which aff same side in both eyes is homonymous.
Hydrops: A collection of water, dropsy.
Hyperidrosis: Excessive sweating.
Hyperalgesia: Increased sensibility to pain, tenderness.
Hyperemia: Increase of blood; fulness of vessels.

Hypoglossal nerve: Twelfth nerve; motor nerve of tongue.
Hypostatic: A condition connected with the dependent position, usually with a determination of blood or other fluid to a lower level.
Hypotonia: Lowered tone, weakness.
Hysteria: A disease or condition characterized by emotional instability, defective volition, and disturbances of sensibility; erroneously supposed to be an affection of the pelvic organs of woman.
Hysteroid: Pertaining to hysteria.

Idiopathic: Developing without cause or without any preceding disease; in reality, a primary morbid state.
Illusions: False perceptions of actual objects, distortions of real things.
Indirect electrization: Excitation of a muscle through a nerve.
Induced electricity: A current induced in a coil from another through which a current passes.
Inhibition: Control which regulates, stops, or suspends function.
Inner table: Lowermost layer of cranial bone which is separated from the upper table by the diploë.
Innervation: Supplying with nerve force.
Insane delusion: A false belief in something which has no existence except in the diseased imagination of the person, and which cannot be removed by evidence of its falsity.
Insistent idea: Obsession, compulsive idea, morbid impulse.
Insomnia: Inability to sleep, wakefulness.
Intercostal: Between the ribs.
Internal capsule—See plate V.
Intervertebral canals: Those between the vertebræ through which the spinal nerves emerge.
Intervertebral cartilages: Those between the vertebræ.
Intervertebral discs: Cartilages between the vertebræ.
Intramedullary: Inside of the cortex.
Ischuria: Suppression of urine

Katatonia: A form of insanity characterized by expressions of depressed and excited states, with a peculiar muscular condition resembling that of catalepsy.
Knee-jerk: A deep reflex produced usually by striking the patella tendon.
Kyphosis: A spinal deformity consisting in an angular projection.

Latissimus dorsi: Large muscles in the back concerned in the movement of the arm downward and backward, raising the lower ribs and drawing the trunk forward.
Laparotomy: An incision through the abdominal walls.
Lead line: A peculiar blue line above the gums in those saturated with lead and supposed to be due to the combination of the metal and the products of decomposed food about the teeth.
Leptomeningitis: Inflammation of the arachnoid and pia, sometimes in connection with the dura.
Lesion: An injury, wound, or point of disease.

Leucocytes: White corpuscles of the blood.
Lithemia: An excess of uric acid in the blood.
Lumbar: Applying to the region of the five vertebræ between the dorsal and sacral.

Main-en-griffe: Claw hand, a peculiar deformity following paralysis of the ulnar nerve.
Major hysteria: Grand hysteria.
Malingerer: One who feigns or simulates disease.
Mammary: Pertaining to the breasts.
Masseter: The great lateral muscle concerned in the movement of the lower jaw.
Materies morbi: Diseased matter existing as a cause.
Mastoid process: A protuberance of the temporal bone below and behind the ear.
Meatus: A passage; the external opening of some canal, *e.g.*, the urethra, the ear.
Medulla: The marrow; here applied to the medulla oblongata or bulb at the superior part of the spinal cord.
Megalopsy: Visual increase in size of objects seen.
Ménière's disease: A form of auditory vertigo dependent upon disease of the ear itself.
Meningitis: Inflammation of the investing membranes of the brain and spinal cord.
Meningomyelitis: Conjoined inflammation of the spinal cord and its membranes.
Menopause: Change of life.
Menses: The monthly periods of women.
Metacarpal: The long bones of the hand between those of the wrist (carpal) and the phalanges.
Metastasis: Transfer of a disease from one point to another by infection or transmission.
Meteorism: A peculiar projection of the abdomen owing to defective tone in its walls.
Micro-organism: A minute organism; a microbe.
Micropsy: Visual diminution of objects seen.
Micturition: The act of urinating.
Migraine: A form of paroxysmal headache.
Milliampèremeter: An instrument for measuring the thousandth part of an ampère.
Mixed nerve: One containing motor and sensory filaments.
Monocular polyopsia: Duplication of objects seen with one eye; usually hysterical or due to astigmatism.
Monoplegia: Paralysis of one muscle or part.
Muscæ volitantes: Flying motes; a subjective expression of disturbed vision
Myelitis: An inflammation of the spinal cord.
Myoclonus: A clonic muscle spasm.
Myographium: An instrument for recording muscular contractions.

Myopic: Short-sighted.
Myotonia: A condition of tonic muscle spasm.

Necrosis: Death.
Neoplasms: New growths.
Nephritis: Inflammation of the kidney; Bright's disease.
Neurasthenia: Nerve weakness (nervous asthenia—Fordyce Barker).
Neuraxon: The axis cylinder; the central part of the nerve.
Neuritis: Inflammation of the nerve.
Neuroglia: The tissue binding together nervous matter proper.
Neuromata: Nerve tumors.
Neuromimesis: The unconscious simulation of disease.
Neuropathologists: Those who study the morbid anatomy of the nervous system.
Neurosis: A functional nervous disease.
Neurotic: Pertaining to the nerves; predisposition to nervous disease.
Nystagmus: A movement of the eyeballs in a lateral or rotatory manner.

Obsession: A dominant and fixed idea.
Occipital: Pertaining to the occipital or great posterior and inferior bone of the skull.
Oculomotor: Pertaining to the movement of the eyeball. The oculomotor is the third nerve supplying all the muscles but two.
Odontoid process: A toothlike projection of the axis bone, which projects into the anterior part of the spinal foramen of the atlas; it is concerned in the rotation of the head.
Olecranon process: A bony protuberance from the upper extremity of the ulnar bone forming the elbow.
Ophthalmoplegia: Paralysis of the ocular muscles.
Optic atrophy: Wasting of the optic nerve or retina.
Optic canal: That through which the optic nerve and its vessels pass to the orbit.
Optic thalamus—See plate V.
Orbicularis sign: Inability to contract the orbicularis palpebrarum alone, though possible with its fellow.
Orbital: Pertaining to the orbit.
Organic paralysis: Paralysis dependent upon some disease of the brain or spinal cord destroying the motor tracts or centres.
Osteal: Pertaining to bone.
Otitis media: Inflammation of the middle ear.
Outer table: External surface of a cranial bone separated from lower table by the diploë.
Oxycephaly: A defect of the skull expressed by abnormal height.

Pachymeningitis: Inflammation of the dura mater.
Palpebral opening: That between the eyelids.
Paracentral: Applied to the gyri or convolutions about the central or Rolandic fissure.
Paralysis agitans: Shaking palsy, Parkinson's disease.

Parietal bone: A large quadrilateral bone of the skull articulating w
fellow above and with the frontal, temporal, and occipital.
Patella: Knee cap.
Pelvic organs: Those contained in the cavity of the pelvis.
Pelvis: A combination of bones at the base of the trunk which co
some of the organs of generation, the lower gut, and certain imp
vessels and nerves, and affording articulation for the lumbar ver
and the thigh bones (femora). It is composed of the following b
sacrum, coccyx, and two innominata, the latter being developed
the union of the ilii, ischii, and pubes.
Pemphigus: An eruption consisting of large blebs or blisters.
Petechia: An appearance on the skin of small spots due to minute ex
sations, and often found after epileptic convulsions.
Petit mal: A minor epileptic attack, usually transitory.
Perineum: The crotch—that part of the body between the thighs exte
from the anus to the vulva or scrotum in woman or man.
Perimeter: An instrument for measuring the extent of the field of visi
Peripheral: Pertaining to the surface of the body.
Peripheral myelitis: Inflammation of the circumference of the cord.
Peripheral nerves: Those nerves principally concerned with the innerv
of voluntary muscles or the surface of the body.
Phalanx (plural, phalanges): Terminal bones of fingers and thumbs.
Phonendoscope: An instrument for auscultation; a variety of stethos
Photophobia: Fear or intolerance of light.
Phrenic nerve: An important nerve supplying the diaphragm and conc
in respiration.
Plantar reflex: Reflex obtained by irritating the sole.
Plumbic: Pertaining to lead.
Pneumogastric nerves: The tenth pair which preside over respiratio
digestion.
Poliomyelitis: A disease of the anterior horns of the spinal cord with
cular paralysis and atrophy and conserved integrity of sensation.
Polyopsia: Visual duplication.
Polyuria: Copious urination.

taxic stage: The first stage of locomotor ataxia.
enility: Premature ageing.
pism: A persistent erection.
is: Drooping of the upper eyelid as the result of paralysis of the third nerve.
ido-hypertrophic paralysis: A disease characterized by a muscular enlargement, paralysis, and subsequent atrophy.
ido-tabes: False or irregular locomotor ataxia.
hasthenia: Mental weakness or tire.
hical: Pertaining to the mind; mental.
hical equivalent: A state of mental disturbance which takes the place of an epileptic convulsion.
hiatrist: One who practises psychiatry; a specialist in mental diseases.
hosis: A condition of mental derangement; an insanity.
onephritis: Purulent inflammation of the pelvis of the kidney.
genic: Pus-making.
midal degeneration: Progressive destructive disease in the pyramidal columns of the spinal cord, usually following a lesion in the brain.

riceps extensor: Those muscles uniting in a tendon attachment to the patella.

ialgia: Back pain.
aud's disease: An affection characterized by a local interruption of blood supply, changes in temperature, and in color of the fingers, and possibly gangrene.
exes: An involuntary muscular contraction following a peripheral irritation.
ex paralysis: A loss of power due to a lesion at a remote point.
rgitation: A flowing backward.
al: Pertaining to the kidney.
na: The innermost nervous membrane of the eye.
dual shortening: Shortening of a muscle after paralysis.
oscleroma: A disease of the nose causing enlargement and peculiar deformity.
berg symptom: Static ataxia.

oma: A malignant growth composed of either large or small cells and often due to trauma.
al cord: That part of the spinal cord enclosed in the sacrum.
hocephaly: Keel-shaped skull.
autz-Krampf: A peculiar contortion of the mouth and nose which is a symptom of certain insanities.
osis: A hardening.
oma: A defect in the visual field, a dark spot.
is: Contamination by putrefying or morbid substances.
ic: Pertaining to an animal poison.
us fluid: The fluid secreted by the serous membranes which lie in the internal cavities of the body.

Staphylococci: Fungus bacilli often found in the mouth, where they a innocuous; but they may be dangerous indications of a septic proce if found elsewhere.

Stasis: A stoppage or determination of blood.

Stellate: Star-shaped.

Sterno-cleido-mastoid muscles: A pair of muscles extending from the st num (breast bone) and clavicle (collar bone) to the mastoid process the temporal bone and to the occipital bone (back of the head).

Sternum: Breast bone.

Stertor: Term applied to a peculiar, noisy form of respiration.

Stigmata: Marks of disease.

Strabismus: Cross-eye or squint.

Strangury: A painful vesical spasm with scanty urine.

Streptococcus pyogenes: A chain-forming micrococcus which occurs in scesses and is associated with septic processes generally (von Jaksc

Suggestion: An influence directed to the subconscious self.

Symptom complex: A particular combination of symptoms.

Synovial sacs: Lubricating cavities.

Syphilophobia: Fear of syphilis.

Systemic: Pertaining to a system or arrangement; usually applied to ease of definite and organized parts, expressed by classical symptoms

Tabes: Wasting locomotor ataxia, degeneration of the posterior columns the spinal cord.

Tabetic: A person affected with tabes or locomotor ataxia.

Tachycardia: Extreme rapidity of pulse.

Tactile anesthesia: Insensibility to touch.

Talipes equinus: A peculiar deformity of the foot, usually due to paralysi of muscles in front of leg and contraction of the Achilles tendon.

Tegmentum: The lower division of the crus cerebri.

Temporal: Referring to the region of the temporal bone.

Tetanic: A violent tonic spasm or contraction.

Tetanus: Lockjaw.

Thyroidal: Pertaining to the thyroid glands.
Thyroids: Two ductless glands at the anterior part of the neck.
Titubation: A staggering, unsteady walk.
Tonic: A term applied to spasm in which there is continued and uninterrupted muscular contraction.
Torticollis: Wry-neck.
Toxemia: Poisoning.
Toxin: A poison, used here in its organic sense.
Trapezius: A muscle of the upper back which in contraction draws the head backward.
Trauma: A wound or injury.
Triceps: A three-headed muscle on the back of the humerus and concerned in the extension of the forearm.
Trigeminus: The fifth nerve.
Trophic: Relating to nutrition.
Tubular union: A means of joining the ends of divided nerves by placing their ends in pipes or canals made of some substance which is eventually absorbed.
Turgescence: Swelling with congestion.
Tympanites: A distention of the abdomen due to gas in the intestines.
Tympanum: The ear-drum.

Ulnar nerve: A large and important nerve supplying the flexors and abductors of the hand, the elbow, and wrist joints, and the palmar and dorsal integument of the little finger and half of the ring finger.
Umbilicus: Navel.
Uncinate gyrus—See Chart II.
Unilateral: On one side.
Uremia: A condition characterized by the retention of excrementitious substances in the blood.

Vagus: The sensory portion of the pneumogastric nerve.
Vasomotor: A term applied to states of constriction or dilatation of a blood-vessel and their results.
Velum palati: The soft palate.
Ventricle: A cavity in the brain communicating with others and containing cerebro-spinal fluid. There are five of these.
Vertex: The vault of the skull.
Vertigo: Dizziness and giddiness with subjective sensations of rotation or confusion.
Vermicular contractions: Wormlike contractions of fibres in the body of a muscle.
Volitional tremor: Tremor increased by intentional effort.

Wrist drop: A deformity of the hand due to paralysis of the extensor muscles.

Zone: A limited area.

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